WORK SESSION AGENDA

Casper City Council
City Hall, Council Meeting Room
Tuesday, September 25, 2018, 4:30 p.m.

Work Session Meeting Agenda Items		Recommendation	Allotted Time	Beginning Time
Recommendations = Information Only, Move Forward for Approval, Direction Requested				
1.	Casper Area Convention & Visitors Bureau Update (Brook Kaufman)	Information Only	20 min	4:30
2.	Casper Area Trails, Path and Bikeway Plan Update (Liz Becher)	Information Only	20 min	4:50
3.	Summer Pool Usage Discussion (Tim Cortez)	Direction Requested	20 min	5:10
4.	Soil Compaction in Residential Areas – Draft Ordinance (John Henley)	Direction Requested	40 min	5:30
5.	One Cent Projects	Direction Requested	30 min	6:10
6.	Agenda Review		20 min	6:40
7.	Legislative Update		10 min	7:00
8.	Council Around the Table		20 min	7:10
			Ending Time	7:30

September 25, 2018

TO: Honorable Mayor, and Members of the Casper City Council

FROM: Brook Kaufman, CEO – Visit Casper

SUBJECT: Natrona County Tourism Update

Meeting Type & Date

Work Session, September 25, 2018

Summary

The Natrona County Travel and Tourism Council is a Joint Powers Board established in 1989 to promote and develop tourism in Natrona County. The Joint Powers Board has one appointee from each municipality in the County, (the Town of Mills, Edgerton, Midwest, Evansville and Bar Nunn); the City of Casper and Natrona County each have 2 appointees.

The 4% Lodgers Tax in Natrona County has been in effect for nearly 30 years and will be on the ballot for voter approval November 6, 2018. This 10 – 15-minute presentation will cover the economic impacts of tourism, the history of lodging tax collections, 2018-2019 budget allocations, recent wins, the challenges we face in growing our visitor economy and where Visit Casper sees opportunity in the future to grow impact and return.

Recommendation

None at this time.

September 19, 2018

MEMO TO: J. Carter Napier, City Manager

FROM: Members of the Infrastructure Sub-Committee:
Liz Becher, Community Development Director
Andrew Beamer, Public Services Director
Tim Cortez, Parks and Recreation Director
Craig Collins, City Planner
Dan Coryell, Parks Manager
Aaron Kloke, MPO Supervisor

SUBJECT: Casper Area Trails, Path and Bikeway Plan Update

Meeting Type & Date: Council Work Session, September 25, 2018.

Action Type: Informational Purposes Only.

Recommendation: That Council consider the recommendations that staff will be bringing forward over the next several months to accomplish the goals outlined in the Casper Area Trails, Path and Bikeway Plan.

Summary: The City of Casper completed a Casper Trails, Path, and Bikeway Plan in Fall 2013. The Plan was funded through the Casper Area Metropolitan Planning Organization. This report will serve as a refresher on the recommendations from the Plan, as well as an update on what has been accomplished to-date.

The Recommendations from the Plan include twenty (20) strategies. They are organized around five (5) criteria: Education, Encouragement, Enforcement, Engineering, and Evaluation.

Strategy 1: **Distribution of Information about Bicycle Facilities**
The MPO Citizen's Advisory Committee will be working on publishing digital and print materials on bicycle facilities in pamphlet form and posting to the City website. This will be in correlation with the Long Range Transportation Plan.

Strategy 2: **Bicycle and Pedestrian Education**
Infrastructure safety improvements near schools are currently being addressed by our Public Services Department, in partnership with the NCSD. Materials from the National Center for Safe Routes to Schools Clearinghouse are available in the schools and will also be posted to the City/MPO website.

Strategy 3: **Bicycling Education Courses**
No courses have been developed yet by our community partners.

Strategy 4: **Review of Local Ordinances for Bicycle Safety**
The MPO will be reviewing current ordinances with the Casper Police Department to ensure they are current and relevant. Bike patrol officers will be

included in the discussion to share their "eyes on the street." The discussions will begin in early October.

Strategy 5: **All Mode Road Safety Training for Patrol Officers**

The Casper Police Department will be provided with videos produced by the National Highway Traffic Safety Administration on "Enhancing Bicycle Safety" and "Enforcing Law for Bicyclists" for training of patrol officers. The MPO will purchase the videos. The videos will also be made available to the Wyoming Association of Risk Management (WARM) for City-wide training, and could be made mandatory for some groups.

Strategy 6: **Expansion of Police Bicycle Patrol**

The Casper Police Department expanded the bike patrol unit in preparation for the 2017 Eclipse, and has maintained the presence downtown and at events.

Strategy 7: **Develop Map of Bicycle Network**

The MPO Citizen's Advisory Committee will be working on updating the map while producing the materials on bicycle facilities in pamphlet form and posting to the City website. This will be in coordination with the Long Range Transportation Plan currently underway.

Strategy 8: **Creation of Events to Encourage Biking, Walking, and Transit**

The Platte River Trails Trust and other local partners have put together annual events to encourage biking, trail use, and transit ridership. A sample flyer about Slow Ride is attached (Exhibit A).

Strategy 9: **Integrate Plan into other plans, policies, and practices of the City**

The Infrastructure Sub-committee has been meeting regularly to integrate the planning, design, implementation, and maintenance of bicycle and pedestrian infrastructure. The Generation Casper Comprehensive Land Use Plan also references the Bike/Ped Plan. Capital projects will be coordinated, schedules prioritized, and funding identified. The FY19 Draft Plan is attached (Exhibit B). With the inter-departmental team, the City is ensuring that all concerns/interests are addressed. Please see the bi-monthly report (Exhibit C).

Strategy 10: **Collect and Analyze Bicycle and Pedestrian Crash Data**

The Infrastructure Sub-Committee will work with the Casper Police Department to review the data beginning in October. This data will be dissiminated and analyzed with the Long Range Transportation Plan too.

Strategy 11: **Continue to Develop a Bicycle Network**

Engineered improvements to roadways and intersections have been put in place to create safe bicycle networks. Durbin and Center Streets were the first to have new lanes installed (Exhibit D). The complete reconstruction of Midwest Avenue, which will begin this fall, will feature a separated bike lane between Oak and Poplar (made of concrete); a first in Casper.

Strategy 12: **Provide Wayfinding Signage for Bicycle Network**

A committee made up of community representatives from the CACVB, MPO, DDA, and Casper Historic Preservation will be working with the Infrastructure

Sub-Committee to design consistent, and attractive, signage to direct all citizens to their destinations, in addition to the bicycle network. The committee will meet in the next two weeks.

Strategy 13: Provide Convenient and Secure Bicycle Parking
Proper placement and design of bicycle racks has been occurring consistently in the downtown core.

Strategy 14: Incorporate Bicycle and Pedestrian Facilities into Routine Maintenance
The Public Services Department has been maintaining the pavement markings on City streets, and the community partners have maintained trail facilities. Property owners downtown maintain the sidewalks.

Strategy 15: Identify and Pursue a Funding Strategy
New bicycle networks are being discussed with all street projects to determine if they can be funded in the bid. Grant programs (such as the TAP grant) are being considered for all City trail and sidewalk projects. The annual Capital Plan outlines priorities identified through a joint consideration of all plans.

Strategy 16: Prioritize Recommended Bicycle Improvements
Bicycle and trail improvements are done in partnership with the Platte River Trails plan, Capital Improvement Plan and Bike/Ped Plan. Striping will be completed along "K" Street and 21st Street as a part of this year's priorities.

Strategy 17: Prioritize Completion of Sidewalk Gaps
The list identified in the Plan is being addressed as funding allows.

Strategy 18: Utilize Engineering Strategies on Roadway Development
These same strategies were identified in Strategy 9 and 11.

Strategy 19: Establish a Bicycle and Pedestrian Advisory Committee
This committee is coordinated through the MPO Citizen's Advisory Committee.

Strategy 20: Establish Performance Measures
A Comments page will be opened on the City webpage for input/feedback related to bicycle and pedestrian services. The Citizen's Advisory Committee will compile performance measures. Performance measures are also a recommendation of the Generation Casper Land Use Plan.

Financial Considerations: None at this time.

Oversight/Project Responsibility: Infrastructure Sub-Committee

Attachments:
Exhibit A: Casper's Slow Ride and Bicycle Bash (September 2014)
Exhibit B: Draft FY19 Capital Projects – Bicycle/Pedestrian Improvement Scoring spreadsheet (August 2018)
Exhibit C: Bi-Monthly Infrastructure Committee Report (July 2018)
Exhibit D: Press Release about Bike Lane Dedication for Durbin and Center Streets (October 2015)

EXHIBIT
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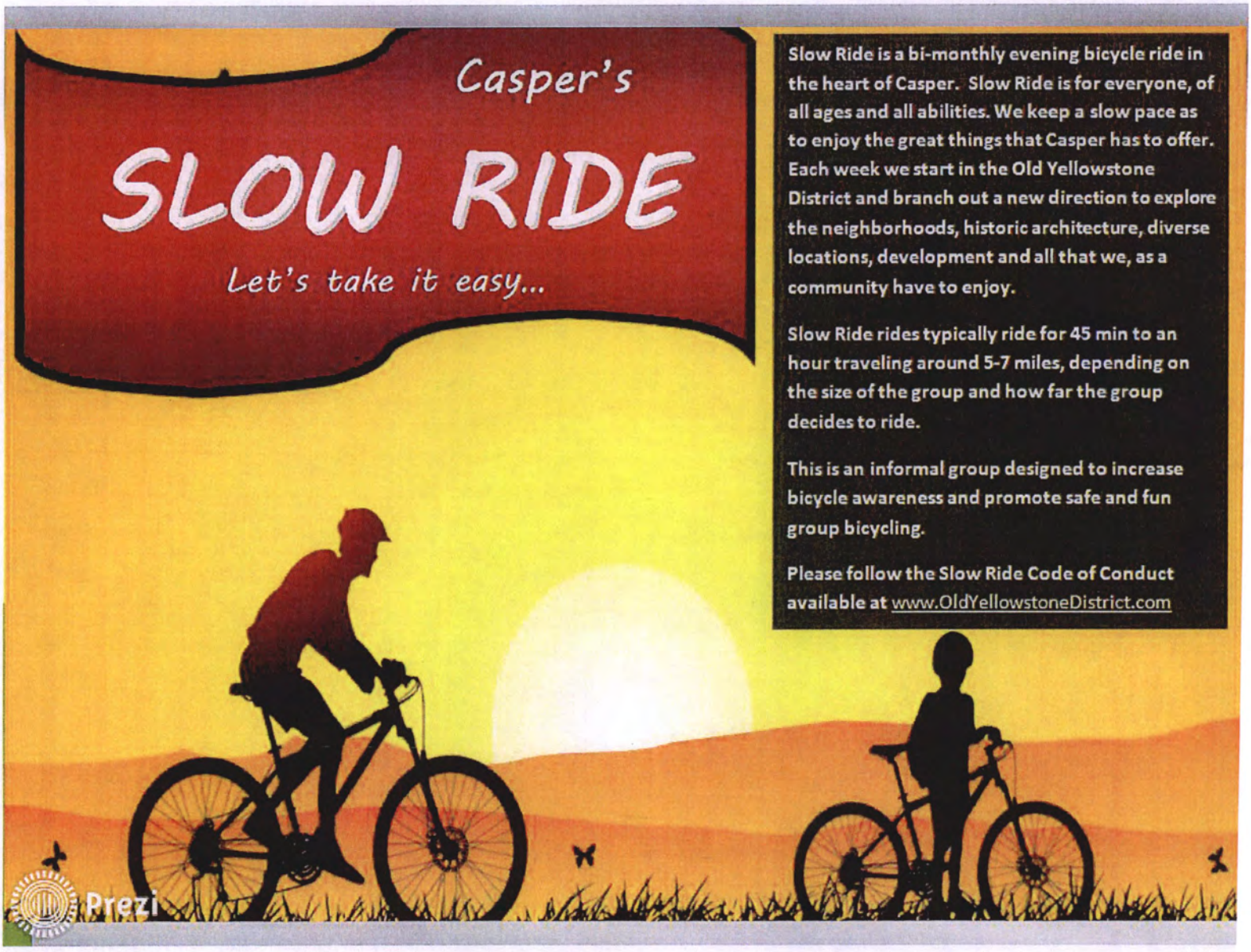


Celebrating Our Cycling Community

September 12, 2014 ~ 6:00 PM—10:00 PM

@ The Yellowstone Garage

6:00—7:00 PM Slow Ride through Downtown

7:00—10:00 PM BBQ– Live Music — Door Prizes — Kids Games with Fat Fish Racing—Bicycling Advocacy Awards

Fun, laughter and good times!

Sponsored by

Yellowstone Garage

Mountain Sports

Teton Distributors

wbc

Crazy Pedaler Bike Repair

Downtown Development Authority of Casper

Fat Fish Racing

Casper City Council

Sandwich Lab

Platte River Trails

Don Juan Mexican Restaurant

Sherrie's Place Restaurant

Yellowstone Bikers of Wyoming

Casper's Slow Ride

The Flour Bin

Donelle's Candies

FY19 Capital Projects - Bicycle Ped Improvements

September 25, 2018

Green highlighted projects are recommended for consideration.

STREET PROJECT			BICYCLE/PED PROJECT			NOTES	TOTAL COST	Plan Score
Street	From	To	Street	From	To			
Bryan Stock Trail	South of Metro Road		Bryan Stock Trail	Metro	K Street	Mixed improvements: Climbing lane and bike lane, Bryan Stock trail, from Metro to K street.	$58,466	33.62
Metro Road	Bryan Stock Trail	Station Road	No Recommendations					
S. Coffman Avenue	W. 25th St.	Odell Ave.	Coffman	Skyridge	Wyoming Blvd	Bicycle Boulevard	$284,289	61.00
W. 12th Street	CY Ave.	S. McKinley St.	Various Improvements			a.) CY and 12th intersection improvement to include 12th St vehicle stop bar on east approach, realign curb ramps and create ped cut throughs on splitter islands to direct pedestrians crossing 12th to use splitter islands; b.) Sidewalk gap between Jefferson and McKinley on north side, 115 ft in length	a.)NA; 2.)$2,300	a.)NA; b.)NA
W. 13th Street	CY Ave.	S. Jefferson St.	13th	Center	Jefferson	Shared lane marking (to connect Center and Durbin bike lanes)	$9,715	70.00
Glendale Avenue	E. 15th St.	E. 21st St.	Glendale	15th	Conwell	Shared road markings	$3,716	75.15
N. Beverly Street	E. Yellowstone Hwy.	Railroad	Beverly	I-25	Rail Trail	Upgrade to sidepath (roughly 2100 feet)	$101,904	53.98
Bryan Stock Trail	RMP Substation	I-25 Ramps.	See above and Note			Improve slip lane crossing for trail on east side.	NA	NA
S. Wisconsin Street	E. 10th St.	E. 12th St.	No Recommendations					
E. 21st Street	Kingsbury Dr.	S. Walsh Dr.	21st	Beverly	Kingsbury	Bike Lane. (Related improvement: bike lane on Kingsbury, from 15th to 21st.)	$89,888	67.70

*Prices include material (thermoplastic) and installation costs

*The higher score equates to higher priority and impact. For context, the highest rated project has a Plan Score of 80.00

FY19 Capital Projects - Bicycle Ped Improvements

September 25, 2018

Green highlighted projects are recommended for consideration.

STREET PROJECT			BICYCLE/PED PROJECT			NOTES	TOTAL COST	Plan Score
Street	From	To	Street	From	To			
W. 53rd Street	S. Oak St.	Casper Mountain Rd.	No Recommendations					
Amherst Avenue	Fairdale Ave.	S. Beverly St.	Bonnie Brae, 17th, and Amherst	14th	Beverly	Shared Road Signage	$7,635	68.77
Eastbrook Avenue	Glendale Ave.	E. 21st St.	No Recommendations					
W. 29th Street	Knollwood Dr.	S. Coffman Ave.	No Recommendations					
S. Walnut Street	W. 19th St.	W. 21st St.	No Recommendations			Note: Plan shows improvements on Walnut, Chestnut, and Spruce. May be unneccesary to improve all three, and we may want to focus efforts on just Spruce and Chestnut.		
Marigold	Valley Dr.	Paradise Dr.	Valley/Marigold	Aster/Indian Paintbrush	Paradise	Shared Road Signage	$6,691	64.97
Tani Field Drainage			No Recommendations					
Coulter Alley Drainage			No Recommendations					
S. Oak Street	CY Ave.	W. 14th St.	Various Improvements			a.) Shared lane markings on Oak, from Collins to 17th; b.) Oak and CY Intersection, many children at this location, add crossing island on west approach where marked crosswalk currently is	a.)$20,881; b.)NA	a.)73.54; b.)NA
College Drive	W. 19th St.	Casper College Playing Fields	Various Improvements			a.) Formalize 10' side path on College Drive from Campus Dr. to Poplar; b.) Add bike lane on College Drive, from Poplar to 18th; c.) Buffered Bike Lane on College, from 18th to Durbin	a.)$92,888; b.)$74,016; c.)$74,918	a.)NA; b.)68.65; c.)67.52

*Prices include material (thermoplastic) and installation costs

*The higher score equates to higher priority and impact. For context, the highest rated project has a Plan Score of 80.00

FY19 Capital Projects - Bicycle Ped Improvements

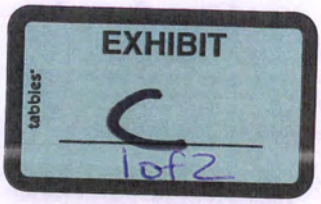
September 25, 2018

Green highlighted projects are recommended for consideration.

MICROSURFACING PROJECT			BICYCLE/PED PROJECT			NOTES	TOTAL COST	Plan Score
Street	From	To	Street	From	To			
2nd Street	Wyo Blvd	Hat Six	No Recommendation					
N Poplar	F Street	Events Drive	N Poplar	F Street	Wilkins	Bicycle climbing lane on right hand side (road diet)	$41,612	45.10
Events Drive	Poplar	Dead end	No Recommendation					
Service Rd	Events Drive	Events Center Parking Lot	No Recommendation					
2nd Street	Conwell	Beech	Intersection Improvement			Encourage pedestrians to cross e 2nd at Kimball St. Consider restricting left turns at Gran and installing crossing island within RRFBW.	NA	NA
Center Street	1st	14th	Varies			a.)Upgrade existing bike lane to match Durbin; b.)Add shared lane marking on Center, from 13th to 14th; c.)Add shared lane marking on Center, from 1st to Midwest.	a.)$52,880; b.)$1,400; c.)$2,800	a.)NA; b.)NA; c.)70.88

*Prices include material (thermoplastic) and installation costs

*The higher score equates to higher priority and impact. For context, the highest rated project has a Plan Score of 80.00



July 30, 2018

MEMO TO: J. Carter Napier, City Manager

FROM: Liz Becher, Community Development Director
Andrew Beamer, Public Services Director
Tim Cortez, Leisure Services Director

SUBJECT: 2018 Strategic Plan Bi-Monthly Report for Infrastructure Goals

CC: Craig Collins, City Planner
Dan Coryell, Parks Manager
Aaron Kloke, MPO Supervisor

Goal: Coordination of Capital Improvement Plan projects with Comprehensive Plan goals

City Staff: Beamer, Becher, Collins, Cortez, Coryell, Kloke

Action: City staff met on July 10, 2018 to review City development plans, partners, funding, and timelines. Plans include:

- 2010/2011 – Parks Plan
- Fall 2013 – Casper Area Trails, Path, and Bikeway Plan
- 2015 I-25 Entryway/Beautification Design Plan
- 2017 Generation Casper Comprehensive Plan
- 2018 Urban Center Parking Plan
- FY19 Capital Improvement Plan (CIP)
- Platte River Trails Trust project priority list

Outcomes:

- Coryell reached out to the Platte River Trails Trust to let them know which projects on their list were legitimate priorities identified/supported by our plans. The Trust was appreciative and open to discussing funding strategies.

- Beamer has made modifications to the FY19 CIP plans for the 21st Street asphalt project to include striping for a bike lane, per the goals identified in the other plans.

- Coryell will begin researching/designing a signage plan for bike lanes.

- Beamer will look at going back to stripe a bike lane along the recently reconstructed "K" Street.

- Staff committee feels that our group represents an excellent cross-section of the community based on where each of us lives. That will be advantageous and informative as we move forward.

Partner List to-date: Platte River Trails Trust, Trail Alliance, WYDOT, Natrona County/Road and Bridge Division.

Next Steps:

1. Finalize partner list/Plan joint meeting
2. Redefine language of strategic goal to encompass "systemic" and "homogeneous" approach
3. Produce data/updates for press releases
4. Determine what projects are possible for the North Casper neighborhood (i.e. trails, park amenities, and sport complexes)
5. Review goals in 2016 Senior Study
6. Begin grant application prep for WBC grant for Midwest Avenue, and TAP grant.
7. Review River Restoration Plan
8. Prepare September 25th work session update about the Bike/Ped Plan

Next Meeting:

Monday, August 20th from 2:30 – 3:30 in the Downstairs Meeting Room

EXHIBIT
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1 of 2

PRESS RELEASE

For Immediate Release

Andrew Nelson
Metropolitan Planning Manager
307-235-8255
anelson@cityofcasperwy.com

Casper WYOCITY

COMMUNITY DEVELOPMENT DEPARTMENT

Dedication of Durbin and Center Street Bike Lanes

The Casper Area Metropolitan Planning Organization (MPO) will be having a dedication ceremony for the new bike lanes on Durbin and Center Streets on Tuesday, October 27th at 4:00 p.m. The ceremony will take place on South Durbin Street behind the Natrona County Public Library where the Casper Rail Trail crosses at Durbin Street. People are encouraged to ride their bike or bring their bike and ride in the new lanes.

Dedication Event

New Bike Lanes on

Durbin Street and Center Street

Tuesday, October 27, 2015

4:00 p.m.

Celebrate With Us!

The dedication of the new bike lanes will take place on S. Durbin Street behind the Natrona County Public Library where the Casper Rail Trail crosses at Durbin Street. Bring your bike and join us in a celebratory ride on the new bike lanes!

Schedule:

4:00 p.m.	Dedication ceremony will include remarks from the Mayor and City Manager
4:10 p.m.	Short Celebratory ride

September 18, 2018

MEMO TO: J. Carter Napier, City Manager JCN

FROM: Tim Cortez, Parks and Recreation Director TC

SUBJECT: 2018 Outdoor Pool Usage

Meeting Type & Date
Work Session
September 25th, 2018

Action type
Information Only

Recommendation
Council to review the information for future decisions regarding aquatics.

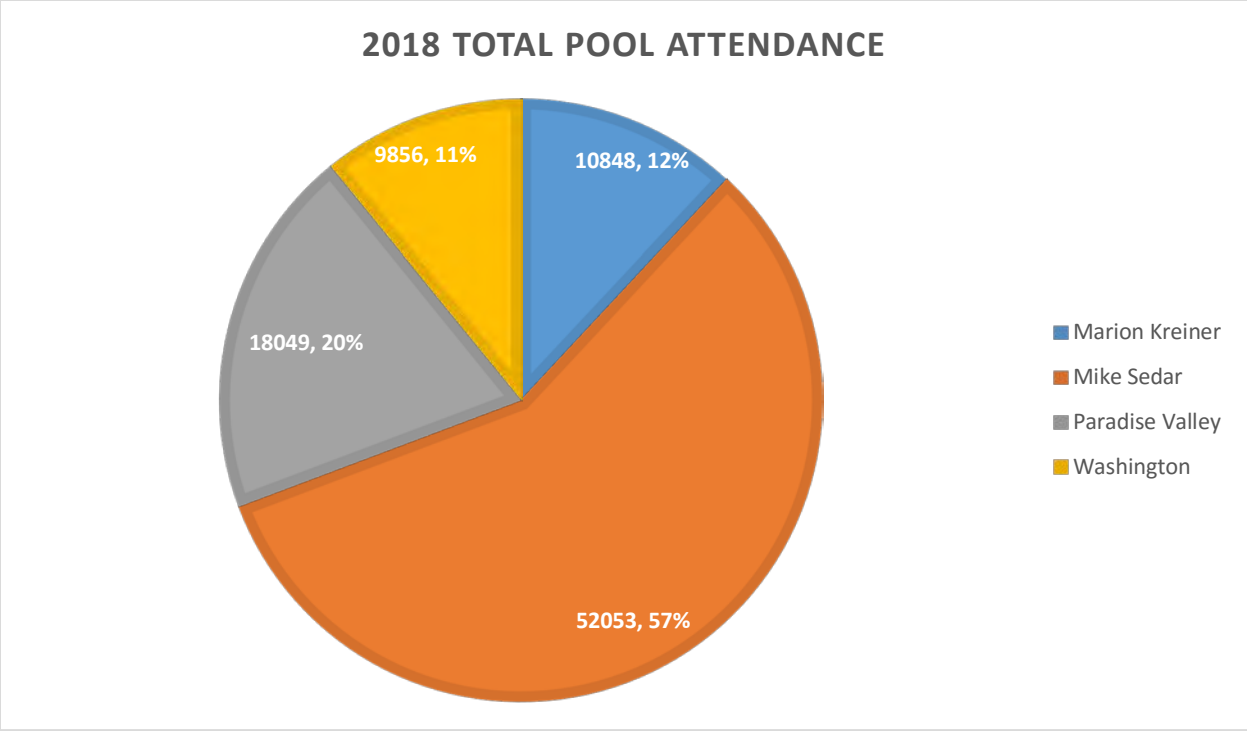
Summary
On April 30th of 2018, staff sent a memo to the City Manager and Council recommending free swimming at Marion Kreiner pool. This decision was twofold. First, to obtain data that may show the relevance of this pool in the community. Secondly, to provide an aquatic experience to children and families who may have difficulty in paying the admission.

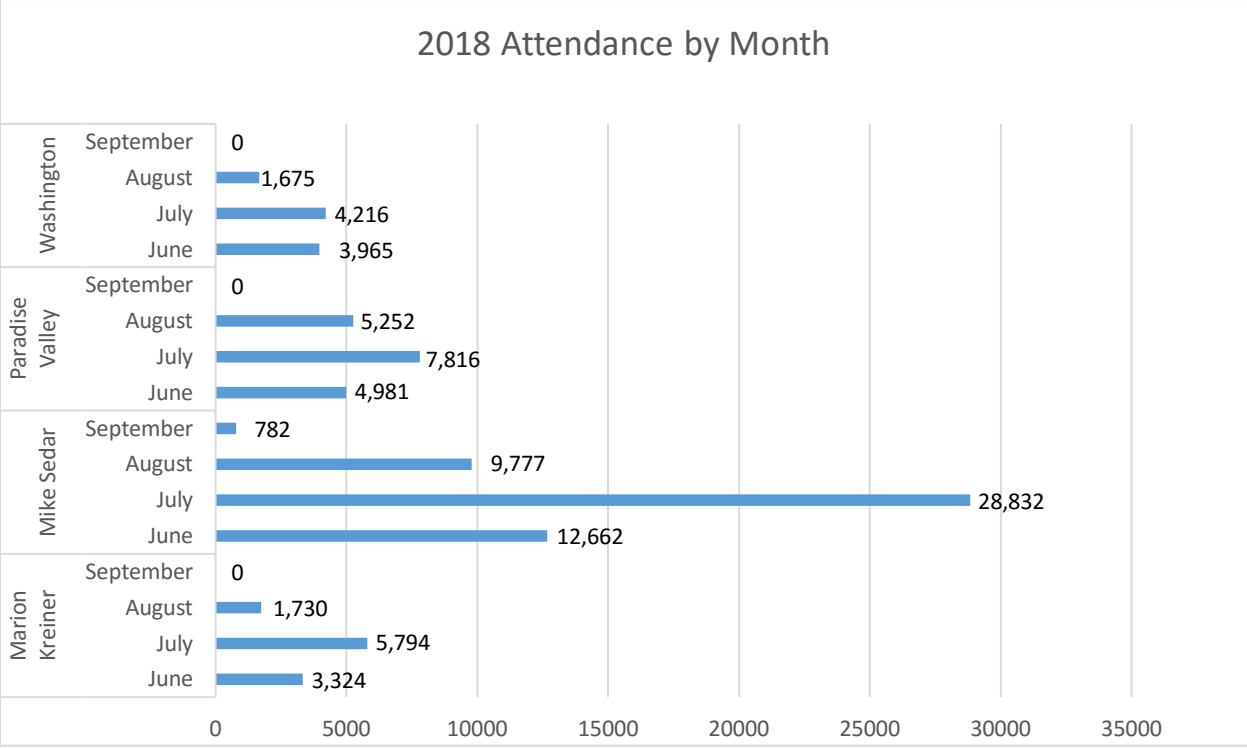
With the end of the summer, staff has compiled the results of all outdoor pools. The attendance numbers do tell a story but it could be debated as to what that story is. However, all pools have strong numbers to show their relevance within the community. Most of all, Marion Kreiner has exhibited a nearly threefold increase in attendance. In addition, concession sales more than doubled.

Financial Considerations
None at this time. However, a capital request will be placed next fiscal year for a liner at Marion Kreiner pool (est. $145,000).

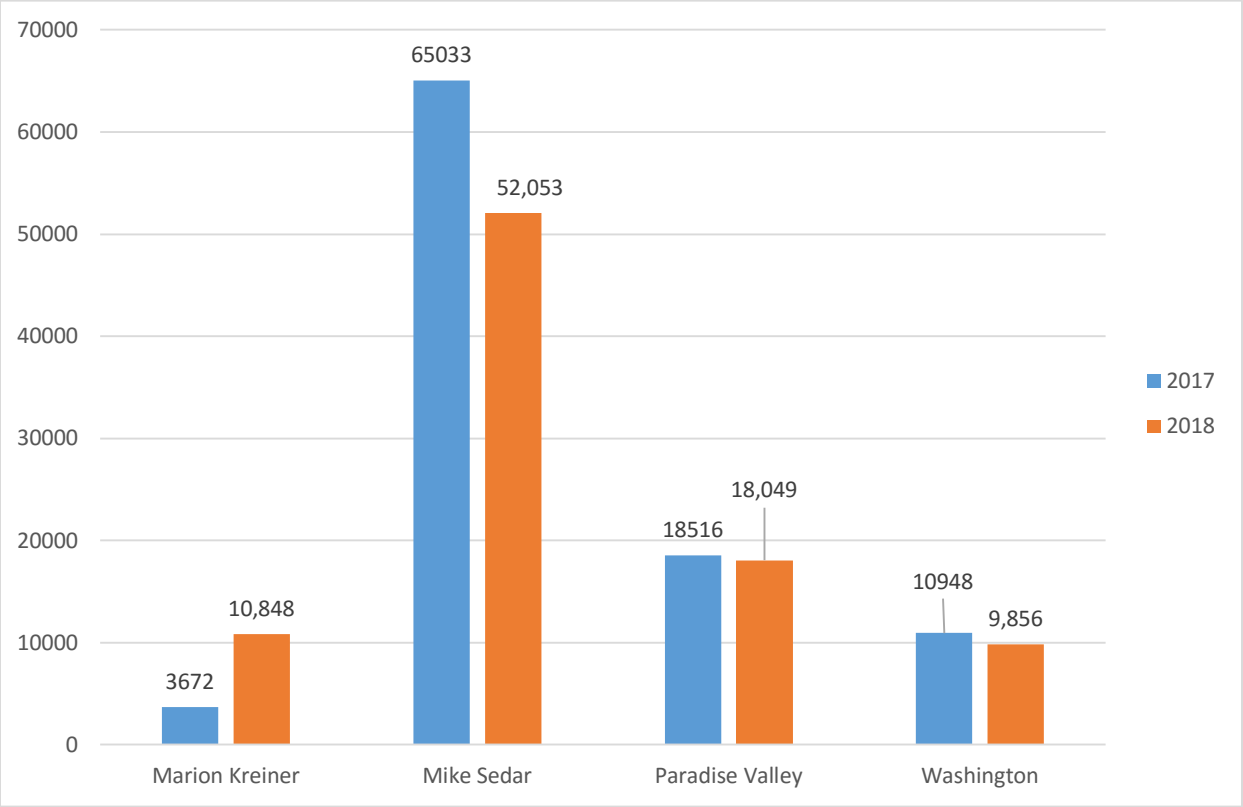
Oversight/Project Responsibility
Blaise Grant, Aquatics Supervisor
Carolyn Griffith, Recreation Manager
Tim Cortez, Parks and Recreation Director

Attachments
Pool Usage Data

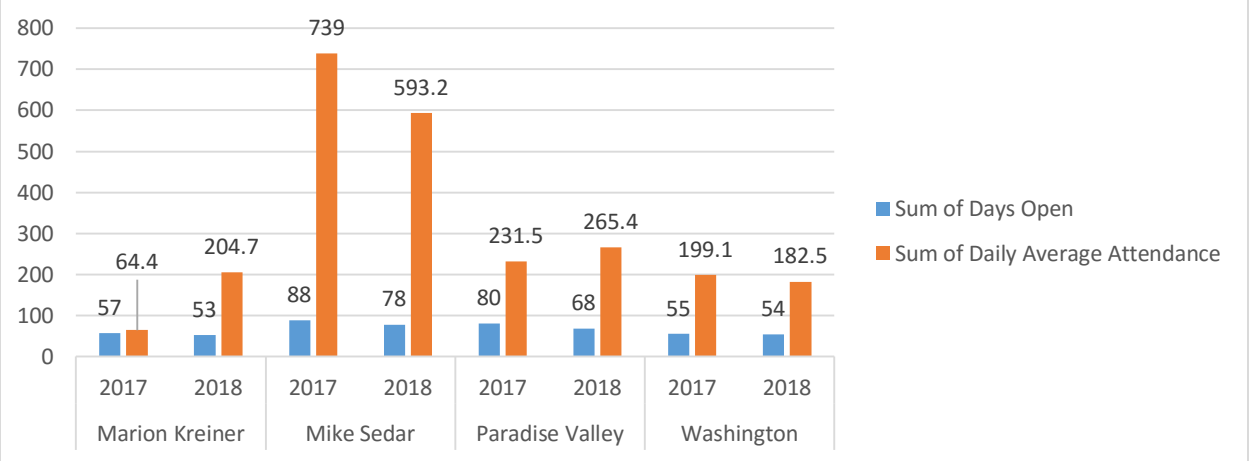

2018 TOTAL POOL ATTENDANCE
10848, 12%
52053, 57%
18049, 20%
9856, 11%
Marion Kreiner
Mike Sedar
Paradise Valley
Washington


2018 Attendance by Month
Washington
September 0
August 1,675
July 4,216
June 3,965
Paradise Valley
September 0
August 5,252
July 7,816
June 4,981
Mike Sedar
September 782
August 9,777
July 28,832
June 12,662
Marion Kreiner
September 0
August 1,730
July 5,794
June 3,324
0
5000
10000
15000
20000
25000
30000
35000

2017 and 2018 Attendance Comparison



2017 and 2018 Days Open and Average Daily Attendance



September 19, 2018

MEMO TO: J. Carter Napier, City Manager

FROM: John Henley, City Attorney

SUBJECT: Compaction Ordinance for Residential Homes

Meeting Type & Date
Work Session
September 25, 2018

Action Type
Ordinance

Recommendation
That Council, review the proposed Compaction Ordinance.

The Concern:

A subdivision in Casper has had homes develop damage, as stated by the homeowners, due to the movement/failures of the completed homes' foundations. These problems in the homeowners' lawsuit were alleged to have occurred because bad soil conditions were known or should have been known by developers, realtors, engineers and at least one builder, and inadequate means were taken to protect the home buyers.

Council, learning of these problems, requested a draft of a proposed soil compaction ordinance, as well as some background data on the extent of the potential problem and the potential cost from implementation of the proposed ordinance.

Allegations:

The plaintiffs and owners of at least 13 homes have alleged: A number of geotechnical investigations were conducted to determine the character and stability of the soil and its suitability for residential home construction; these investigations revealed that certain portions of the development lands contained fill dirt, voids and broken concrete transported to the land from other locations and revealed that the soils in the development included both "highly expansive" claystone with a moderate to high swell potential and soils that were subject to consolidation or settlement due to poor fill conditions. The geotechnical engineers also advised that, if shallow foundation systems (without drilled pier foundation systems), were utilized, there was a high likelihood that the majority of the residences constructed within the development would experience significant structural damage within the first five to ten years following completion of

construction. Due to these conditions, the geotechnical engineers recommended that the homes be designed and constructed with a drilled pier foundation system.

The Defendants have generally denied the allegations.

Background:

As we understand it, there were multiple soils reports completed for the area in question.

It is our understanding that some soils engineers recommended piers be used, while another soils engineer had recommended simply the removal of suspect fill dirt and replacement of fill dirt of a certain quality, and usually wider footings.

It should be noted that, as a matter of routine, most homes, when there has been excavation for foundations and backfill put in around the foundations, that compaction occurs. However, there are some contractors which do not undertake this procedure, but this type of compaction does not seem to be the concern of the plaintiffs and, of course, the geotechnical investigations were made before the homes, townhomes were constructed.

In order to verify that this type of compaction is done and done properly, there would have to be measurements undertaken by a geotechnical firm; an example of those would be Inberg-Miller Engineers.

Costs:

Based upon letters we received from contractors (attached), along with an informal conversation between city staff and Inberg-Miller, the cost compaction testing will vary due to the structures' size and foundation configuration.

The basic costs are approximately $105 per compaction test, but a compaction test will have to be performed for every 12 to 24 inches of vertical lift for most foundation walls. That is, if there were a square or rectangle house with 9 feet of excavation for a basement foundation, there would have to be 36 separate compaction tests - one test for every 12 inches or 18 separate compaction tests – one for every 24" for the four foundational walls comprising the home. For more elaborate floor plans, the number of tests would likely increase.

Mr. Harmsen (see Exhibit "A") believes that the basic cost perhaps would be approximately $4,000.00 and that there would be significant lost time while construction is stopped and testing takes place. In addition to the customer testing, there is the mileage which we understand is billed typically at one dollar per mile to get to and from the site and there are the hourly costs for the senior engineer who is back in the office after the compaction tests data has been compiled.

Perhaps even more concerning to contractors, according to comments received by staff, is the inefficiency of working with another testing organization such as a soils compacting testing firm which would require coming and going from the site on multiple occasions, due to the multiple

tests that would be required for the compacting testing firms to be comfortable in issuing a report.

The proposed Ordinance does not require compaction testing if homes are built on piers, or the soil testing reports do not require soil compaction testing, as it is presently proposed, but, of course, the proposed Ordinance can be amended to require compaction testing on all homes, should Council choose to do so. Contractors who visited with staff felt soil compaction testing should not be required and certain that the use of piers for home support should exempt the home from soils compaction testing. The contractors who responded to survey requests or who sent comments, felt uniform compaction testing was not necessary (good builders will do a good job) was too inefficient, (waiting for testing to professionals to arrive and be completed) and was too costly, both the cost of the testing, as well as the inefficiencies – See comments and surveys - Exhibits A and B.

Likewise, other municipalities in Wyoming who responded to staff inquiries, uniformly did not require backfill foundation soils testing. (Natrona County, Gillette, Cody – but if geotechnical questions, then stamped, certified geotechnical engineers' evaluations for foundations are required – Sheridan, Teton Counties).

Ordinances already in place:

The International Residential Code is a standard code for one- or two-family dwellings. Requirements under the Chapter of the International Residential Code for Foundations are stated in our 401.2 quoted below:

"**R401.2 Requirements.** Foundation construction shall be capable of accommodating all loads and of transmitting the resulting loads to the supporting soil, in conformity with Section R301 and Chapter 4 of the International Residential Code. Fill solids that support footings and foundations shall be designed, installed and tested in accordance with accepted engineering practice..."

The Building Code, which addresses structures larger than one- or two-family dwellings has a provision which addresses the requirements of information to be included in a soils report. (The soils reports for this in litigation development, at least to my eye, had this baseline of information). The requirements are stated:

"This geotechnical report shall include, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered.
5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.

6. Expected total and differential settlement.
7. Deep foundation information in accordance with Section 1803.5.5 of the International Building Code.
8. Special design and construction provisions for foundations of structures founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.8 of the International Building Code.
10. Controlled low-strength material properties and testing in accordance with Section 1803.5.9 of the International Building Code.

The proposed compaction ordinance includes the requirements as stated above.

In the area that brought the compaction issue before the Council, general soils testing by the developer was done and provided to the City's Community Development Department and this report, as well as other reports provided to the Community Development Department, are available for review, should the Contractor not be provided relevant documents by the developer. Similarly, these documents are available for review by a citizen who is contemplating the possible purchase of a lot within a development or anyone else who makes such a request. Copies of soils reports for the area in question, as I understand it, are attached as "B1," "B2," and "B3."

The attached proposed Ordinance does incorporate suggestions from the letters and surveys, most of the concern was with the quality of the developments' soils before construction starts.

Request for Council: May we have another work session, with staff comments, to determine if this is the direction that Council wants given the construction concerns, costs and amount of information that was available to the developers, builders and engineers through the usual private sector process.

Financial Consideration:

Not applicable for City, but see above discussion regarding additional costs of construction.

Oversight responsibility:
Craig Collins, Community Development and Dan Elston, Building Inspector

Attachments:

"A" Letters
"B": B1: Ground Engineering Sept. 2013 (Mesa Phase 1); B2: Inberg-Miller Dec. 2014;
B3 Hollingsworth Associates, Inc. July 2015
"C" Survey Responses – Other Comments
"D" D1: Summary Matrix – Letters
D2: Summary of Survey Results
"E" Draft of Proposed Ordinance

EXHIBIT "A" – TEN (10) PAGES – 6 COMMUNICATIONS

Dan Elston
City of Casper
Building Department

Dear Dan,

Just getting back to you after our discussion the other day about the possibility of the City of Caser requiring compaction testing on all foundation when backfilling.

I am definitely against this being a new ordinance or requirement in the City of Casper.

Most builders are doing a good job in backfilling their foundations. Requiring testing would cost us time (scheduling, waiting for the engineer to show up and do the test) and the consumer money. The test would have to be done after every lift of dirt backfilled, which could be 3 or more lifts and tests. In the winter and spring when moisture may be needed to get the correct compaction test, frost and freezing may create more problems.

Building in Casper for more than 30 years has taught me that there are many building practices that work and every house that we build we adjust to the type of engineering required and the time of year we are building.

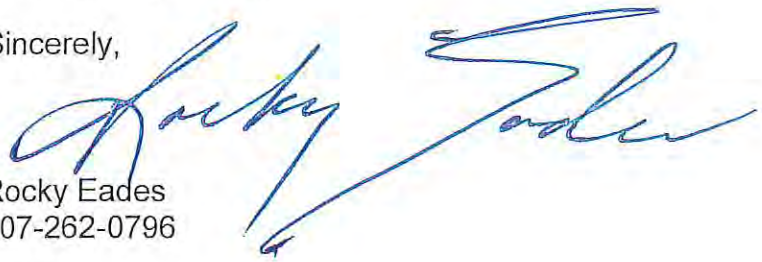
For instance, after a foundation is poured the concrete walls are green and susceptible to bowing and cracking. We have to be careful how much pressure we put on these walls when backfilling and compacting. We would backfill and compact to a certain height, then don't compact. The last lift is not compacted until later after the floor is on (which helps support the walls) and the concrete has cured which gives it much more strength. Every foundation is different depending on size, shape and engineering.

Improper back filling and compaction can cause minor problems, such as patios, sidewalks to settle.

I think the big issue is that builders use good soil testing followed by good foundation and structural engineering to build their homes, which the City of Casper Building Department requires when issuing building permits and construction of the homes. When builders don't follow that engineering, is when major problems can arise.

Dan I would be happy to sit down and talk to you and others about this issue. Please call me if you have any questions.

Sincerely,



Rocky Eades
307-262-0796

Dan Elston

From: jeff copperleafcustombuilders.net <jeff@copperleafcustombuilders.net>
Sent: Monday, July 02, 2018 6:06 PM
To: Dan Elston
Subject: Proposed compaction rules
Attachments: Scan1023.pdf

Hi Dan,

I was thinking about our conversation today, and looking into some of our historical costs for materials testing. While I can appreciate the concern for density testing due to some recent failures, I think that any proposed rule changes concerning compaction at the stage when the building contractor begins would be too late to make any difference. In my experience, structural failures of foundation components are very, very rarely associated with the backfill density of foundations and utility trenches. This is a matter that needs to be addressed at the over-lotting stage of development if you truly want to make a difference. I can't tell you how many soils reports that I have read in Casper that have disclaimers attached. Everything from in-frequent to no testing of over-burdens as deep as 30' are where the problems lie. As I mentioned, I worked for a big builder in Colorado. From the moment the earthmovers hit a piece of raw ground for development, there would be a geotechnical engineer on-site daily. They monitored that organics were correctly stripped prior to "cuts and fills" as well as doing all of the nuclear density testing not only for the building lots, but for streets and all wet/dry utilities as they went in. Those reports were submitted to the municipality before the subdivision was ever accepted. While I won't pretend to know the policies in place for developers here, from what I have read and seen, this is where the deficiencies lie.

Unless there is a requirement from the Geotechnical Engineer for an over-excavation of the soils supporting foundation components...we don't test for density. We rely upon our soils investigation and subsequent report for each lot to provide prescriptives for foundation construction. Those foundation recommendations found within the reports tell us what type of foundation system needs to be used, and how to address water or low-density soils around the foundation as they present themselves. What we as a builder or you as the governing authority don't know, is if the bottom of our excavation is sitting on 20' of over-burden which was put in "loose" without verification of density by the developer! So in my opinion, the focus on density testing of foundation backfill misses the target entirely. Yes, you may prevent some flatwork concrete from failing, but it will do nothing to prevent the catastrophic foundation failures like the ones North of CY Middle School. Tighten up the testing reins on the developers, and you will solve your problem!

As far as the cost of testing goes, that depends upon a lot of factors. First, to even produce a density test, a Geotechnical Engineer must take a physical sample of the native soils to be run through the lab. These results enable them to determine what the optimum water content and density should be for that particular soil. We all know that soils around Casper can change dramatically between neighborhoods and in many cases between individual lots of a subdivision. What this means, is that if you intend to backfill with native soils, that soil must be sampled and tested before a proctor can be established. The cost for this sample alone can run from $1000-$2000. The next step would be in proper mechanical placement of the fill materials. This includes properly moisture conditioning the soils, placing them in shallow lifts around the foundation and mechanically compacting them to design density. This can be an expensive proposition, as you introduce the costs of water trucks, additional labor, and time lost between density inspections. You would easily double, and possibly triple the cost of a typical backfill by requiring "controlled" backfilling. The cost of the actual nuclear density testing depends upon the frequency of the tests (i.e. every 10 lineal feet) and the depth of the backfill. For instance, if you have a typical 2000 square foot home with a full, 9' basement wall height, you would be looking at around 360 lineal feet of foundation wall. If you tested that backfill material in 12" lifts (as most engineers require for accurate density testing) and 36 times around the foundation for each lift, you would probably have over two hours of testing at each interval. Take that 2 hours times 8 lifts around that house, and you just added 16 hours of engineering time at roughly $250/hr to the job...or $4000.00 That doesn't account for the lost time

while equipment sits idle during testing at $125/hr...which could be another $2000.00. What about Winter building? The International Code specifically states that frozen materials can not be built upon or used for backfill. We can't water the soils to get to optimum moisture for fear of freezing, so does building get shut down through the Winter?

In conclusion, I just can't see that requiring density testing for backfill around foundations or utility trenches is going to make a meaningful impact. Testing and assurance needs to occur at the development stage to best combat foundation failures. By enacting new rules for density testing of backfill, about the only thing that you will accomplish is to effectively add **$10,000-$12,000.00** to the cost of the average new home. Sure, you might force a few of the unscrupulous builders to do a better job supporting their front porch, but that really isn't the issue we are talking about here. The costs of construction in Casper are already very high, and adding even more un-necessary cost will only further stifle affordability in this community.

P.S. I attached an excerpt from the soils report for "The Heights" behind the car dealers. Take a look at the bottom paragraph on page 4...just what I was talking about as far as no quality controls at the development stage. How can the builder be liable for failures of the guy that was working 10-20 feet below him?

Cordially,

Jeff Harmsen
Copperleaf Custom Builders of Wyoming
3743 W. 38th St.
Casper, Wy.
82604
(307)267-3301
http://www.copperleafcustombuilders.net

nor when checked approximately 2 days after the completion of drilling. These observations represent groundwater conditions at the time of the observations only, and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors. The possibility of groundwater fluctuations should be considered when developing design and construction plans for the project.

Fluctuations in groundwater levels can best be determined by implementation of a groundwater monitoring plan. Such a plan would include installation of groundwater piezometers, and periodic measurement of groundwater levels over a sufficient period of time.

ENGINEERING ANALYSES AND RECOMMENDATIONS

Geotechnical Considerations

The site appears feasible for the proposed construction of residential houses, from a geotechnical engineering perspective. However, potentially expansive bedrock will require particular attention in the design and construction of the structures. *Because of the expansive bedrock conditions in some areas of the development, it is important to establish and maintain good surface drainage, especially in the immediate area of the proposed residential structures.*

Due to the variable elevation of the top of bedrock, spread footings supported on native soils and/or new engineered fill are suitable for certain building lots whereas drilled piers/caissons are more suitable on other lots. It is imperative that the appropriate foundation system be used on each building lot. The Foundation Type Plan included in this report indicates the type of foundation anticipated to be feasible on each lot, based on information from the soil borings. It is recommended that additional exploration, such as test pits or borings, be performed on each individual lot not already drilled to verify the subgrade/bedrock conditions and the appropriate foundation type.

Approximately 2.5 to 23 feet of fill was encountered in the borings performed at the site. The existing fill placement was observed and tested by CEPI. It is our understanding the fill materials were tested by CEPI on an "as-requested" basis during construction. Based on a review of the soil density test results provided to us, the test locations and elevations are not clear. In addition, the quantity of tests performed appears to be low for a project of this size. Based on standard penetration test results and review of the field density test data provided, the existing fill appears to be suitable for support of spread footing foundations. However, it should be noted, there is an inherent risk for the owner that uncompacted and untested fill was

not encountered during the soil borings performed for this study and compressible fill or unsuitable material within or buried by the existing fill was not discovered during fill placement.

As presented on the enclosed boring logs and swell-consolidation test results, expansive soils are present on the site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and at least minor cracking in the structure's foundation system and floor slab should be anticipated. The severity of cracking and other cosmetic damage, such as uneven floor slabs, will probably increase if any modification of the site results in excessive wetting or drying of the expansive materials. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. Some of these options, such as the use of structural floors or overexcavating and replacing expansive material are discussed in this report. We would be pleased to discuss other construction alternatives with you upon request.

Basement construction is considered feasible, based on the subgrade and groundwater conditions encountered. Basement construction design should include a complete underslab and perimeter foundation drainage system. Design and construction recommendations for foundation systems and other earth related phases of the project are outlined below.

Conventional Spread Footing Foundation Systems

Based on our analysis, houses situate on the following lots can be supported on conventional spread footings bearing on native soils, existing fill, and/or new engineered fill utilizing full-basement construction:

- Lots 1-8, 19, 29, 30, 35 and 36, Block 1
- Lots 1-3, 22, and 35-37, Block 2
- Lots 1-5 and 10, Block 3
- Lots 1-5, 7, and 11-13, Block 5

The locations for spread footing construction are also shown on the Foundation Type Diagram, Figure 2 in Appendix A of this report. It should be noted the recommendations contained herein assume the design subgrade elevation is within one foot of the existing

Dan Elston

From: Tim Schenk <tschenk@gsgarchitecture.com>
Sent: Tuesday, September 04, 2018 7:57 PM
To: Craig Collins; Dan Elston
Subject: Response to the Coffee talk geotech issue

Hi guys!

Hope you both had a great 3-day weekend!

After last week's coffee talk, I visited with a couple realtors and one contractor. Since that time, I have re-thought my statement about the necessity to require compaction testing for foundation backfill on single family residential projects. Thus, I would like to offer the following compromise.

I truly believe that the final grade the home's foundation and floor slab are placed on, should be properly compacted and tested by a licensed soils engineer. This is the most critical part of the structural system and should not be overlooked. In order to accomplish this, there must be a geotech study of the site, to determine the soil type and its bearing capacity. As long as this information is followed, a qualified contractor should know what to do to accomplish this. The geotech report should also offer guidelines for backfill, and that should be sufficient for the contractor to follow, without any additional testing.

If there is settlement, then it ultimately falls back on the general contractor's warranty, and they should be responsible to make the necessary repairs, at no additional cost to the owner.

Hope this is helpful.

Tim

Tim Schenk, AIA, NCARB
GSGarchitecture
Senior Project Architect
606 S. David Street, Casper, WY 82601
www.gsgarchitecture.com
o: 307.234.8968 | c: 307.259.6529

John Henley

From: Dan Elston
Sent: Wednesday, September 12, 2018 1:15 PM
To: John Henley
Subject: FW: Foundations and Compaction

From: John Alt [mailto:jca@trimountainhomes.com]
Sent: Wednesday, September 12, 2018 10:22 AM
To: Dan Elston
Subject: Foundations and Compaction

My thoughts are:

1. Every subdivision should be required to have a geotechnical report. The lot specific report should be turned in with the engineered foundation plan at the home permit stage. An open hole inspection, would be the final step in the geo-tech aspect of the foundation process.
2. In the foundation design, the engineer will consider site conditions such as bearing capacity, drainage, and the specific foundation loading needs for the specific house. At the very minimum, the geotechnical recommendations and soil property test results need to be considered and the IRC Chapters 4 and 5 followed.
3. On a standard footer foundation design, most often the geotechnical report will call for the footer to be placed directly on the native material and no additional compaction. This is the most homogeneous condition of the soil and minimizes differential settlement. If the material that the footer is place on is a fill or some other varying, non-homogeneous material then the geotechnical report will generally call for scarification and re-compaction or over-excavation, replacement and compaction. This is the generally the only situation compaction tests would be needed for foundations.
4. A well designed and placed foundation drain with a working sump pump is very critical to keeping the materials from becoming saturated and loosing strength under a foundation causing settlement.
5. Positive drainage away from the foundation walls and good site drainage are absolutely necessary for houses to remain stable.

John

--

John C. Alt

Tri Mountain Homes
P.O. Box 2207
Gillette, WY 82717
trimountainhomes.com.

John Henley

From: Craig Collins
Sent: Tuesday, September 11, 2018 12:29 PM
To: John Henley; Dan Elston
Cc: Liz Becher
Subject: FW: Compaction testing residential

From: Charlie Shopp [mailto:charlie@casperopen247.com]
Sent: Tuesday, September 11, 2018 11:47 AM
To: Craig Collins <ccollins@casperwy.gov>; Liz Becher <lbecher@casperwy.gov>
Subject: Compaction testing residential

Craig

This letter is to inform the City of Casper, Wyoming that I do not support the proposed Compaction Testing on all new residential construction. What I have been told that this could add $10,000 to $15,000 to each residential lot to have completed. This additional cost will need to be passed along to the home owner and this is not feasible for most homeowners to absorb. The other item that needs to be taken into consideration is that engineering companies may not want to complete this type of testing on residential properties because of the liability that could occur from their testing.

The thought that this is going to solve the problems with settling around residential homes is absurd. This kind of testing is now being done on commercial projects in Casper and I would be happy to point out to council a number of commercial projects that have settling problems even with the compaction testing. This problem is more about the contractor that was hired to build the project and not the lack of testing. We presently have soils test that competent contractors use along with their engineers to determine the foundation that is needed for the structure. Additional testing in my opinion is not need to protect the consumer.

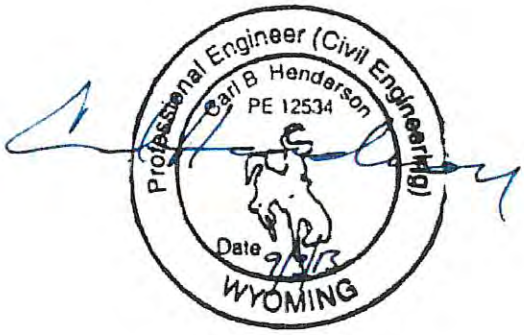
I do appreciate the opportunity to respond to the proposal of the Compaction Testing and hope the City will make the correct decision.

Charlie Shopp
RE/MAX The Group
350 W. "A" Street Ste. 100
Casper, WY 82601
(ph)307-265-0200
(fax)307-265-0024

The requirement for compaction testing on residences is too broad and complex for a generalized ordinance making it a requirement for every house. The requirement needs to be dependent on the specific soil conditions encountered on each lot. This requires a geotechnical study to be performed which includes drilling, soil sampling, laboratory testing and a report prepared by a geotechnical engineer. For example, if the soil conditions on a lot are granular and the geotechnical report recommends placing footings on natural, undisturbed soil, then the need for compaction testing below the foundation should not be required. Testing native soil for compaction is not ever recommended because the results will be low and inconsistent. And yet, when the soil conditions allow placement on natural, undisturbed soil, there are significant advantages, the most important one being that settlements will be more uniform and it minimizes the cost of construction. Another example would be where over-excavation and placement of structural fill below foundation is recommended. Obviously, compaction testing of newly placed fill is critical and should be a requirement. But this requirement comes from the geotechnical recommendations, not the City. The City should be involved to the extent that they should review the geotechnical reports and make sure the contractors are following them. The recent instances where houses have been damaged due to settlement or swelling soils are due to poor construction, contractors not following the geotechnical recommendations, and in some cases not getting foundations properly designed by a professional engineer. Increased inspections during foundation preparation and construction by either the City inspectors or a geotechnical engineer would be more appropriate. City inspectors may have more leverage to make a contractor do things correctly.

EXHIBIT "B1" – THIRTY-FOUR (34) PAGES
Ground Engineering Sept. 2013 (Mesa Phase I)

Subsurface Exploration Program
And Geotechnical Recommendations
Mesa Del Sol Subdivision, Phase I
Casper, Wyoming



Prepared for:
SenergyOne Development, Inc.
550 North Poplar Street
Casper, Wyoming 82601

Attention: Mr. Randal Hall

Job Number: 13-7017 **September 3, 2013**

GROUND
ENGINEERING CONSULTANTS
412 North Fenway, Casper, WY 82601 Phone (307) 577-0800 Fax (307) 577-0801 www.groundeng.com
Office Locations: Casper • Englewood • Commerce City • Loveland • Granby • Gypsum

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PURPOSE AND SCOPE OF STUDY

This report presents the results of a subsurface exploration program performed by GROUND Engineering Consultants, Inc. (GROUND) to provide geotechnical design criteria and recommendations for the proposed eight (8) single-family residences to be located northeast of the intersection of Pheasant Drive and Jordan Drive in Phase I of the Mesa Del Sol Subdivision in Casper, Wyoming. Our study was conducted in general accordance with GROUND's Proposal No. 1307-1237R3, dated August 28, 2013.

Field and office studies provided information obtained at the test hole locations regarding surface and subsurface conditions, including existing site vicinity improvements and depths to bedrock and groundwater. Material samples retrieved during the subsurface exploration were tested in our laboratory to assess the engineering characteristics of the site earth materials, and assist in the development of our geotechnical recommendations. Results of the field, office, and laboratory studies are presented below.

We understand geotechnical work for public roads and infrastructure have been previously performed for the area. However, a copy had not been provided for our review at the time of this report.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of engineering considerations related to construction of the proposed structures are included herein.

PROPOSED CONSTRUCTION

We understand that the proposed construction is to include eight (8) lightly loaded, wood framed, single-family residential structures with assumed basement construction. Based on the proposed construction and existing site topography, we estimate cuts and fills of up to 10 to 12 feet may be necessary in order to facilitate proposed construction.

We assume that development will include installation of shallow underground utilities, and associated cut and fill activities, to service the proposed residences. If the proposed construction, including the anticipated site grading or loading conditions, differ from

those described above, or changes subsequently, GROUND should be notified to re-evaluate our recommendations in this report.

SITE CONDITIONS

At the time of our exploration, the project site consisted of a previously graded area northeast of the intersection of Pheasant and Jordan Drives. The topography was generally flat and level, sloping down to the north at approximately 4.5 percent. The ground surface was sparsely covered be native grasses and weeds.

Based on project team provided information, we understand the area contains fill materials placed at various times within approximately the last 3 decades. Compaction test data is believed to be unavailable or perhaps non-existent for older fills. However, we understand the most recent fill may have been tested for compaction, although test data was not available for review at the time of this report. Fill on the west side of the project was reportedly placed in the late 1970's and early 1980's, with newer fill located on the east side of the project area. The newer fill was placed by Carr Construction during overlot grading of the entire Mesa Del Sol Subdivision. Based on a review of historical aerial photographs, this fill appears to have been placed between 2006 and 2009 (Figures 1B abd 1C).

The original ground surface in the surrounding area appears to have been gently to moderately rolling with numerous ridges and drainages. The topography within the Phase I area, between the old and newer fill placement appeared to have sloped down to the east into a drainage located beyond the east edge of Phase I. We also understand that a storm sewer was placed in this drainage prior to the placement of new fill.

SUBSURFACE EXPLORATION

The subsurface exploration for the project was conducted on July 24, 2013. A total of four (4) test holes were drilled with a truck-mounted, continuous flight, power auger rig to evaluate the subsurface conditions, as well as to retrieve soil samples for laboratory testing and analysis. The test holes were advanced to depths of approximately 30 to 35 feet below existing grades. A representative of GROUND directed the subsurface exploration, logged the test hole in the field, and prepared the samples for transport to our laboratory.

Samples of the subsurface materials were retrieved with a 2-inch I.D. California liner sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches. This procedure is similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depths at which the samples were obtained and associated penetration resistance values are shown on the test hole log.

The approximate location of the test hole is shown in Figure 1. Logs of the exploratory test holes, explanatory notes and legend are presented in Appendix A.

LABORATORY TESTING

Samples retrieved from our test holes were examined and visually classified in the field by the project engineer. Laboratory testing of soil samples obtained from the subject site included standard property tests, such as natural moisture contents, grain size analyses, swell-consolidation potential, unconfined compressive strength and liquid and plastic limits. Water-soluble sulfate and corrosivity tests were completed on a select sample as well. Laboratory tests were performed in general accordance with applicable ASTM protocols. Results of the laboratory testing program are summarized on Table 1.

SITE GEOLOGY

Geologic maps[1] depict the site as lying within the Phanerozoic to Late Cretaceous Cody Shale. The Cody Shale is generally described as consisting of brown to gray shale and siltstone.

SUBSURFACE CONDITIONS

The subsurface conditions encountered in the test holes generally consisted of a thin layer of poorly developed topsoil a few inches thick underlain by silt/clay and sand material with occasional gravel lenses to a depth of 30 feet in test hole TH-1, and to the test hole termination depths of 30 to 35 feet in the remainder of the test holes. Sandy claystone bedrock was encountered at a depth of 30 feet to the test hole termination depth of 35 feet in test hole TH-1. The bedrock is interpreted be of the Cody Shale.

[1] Love, J.D. and Christiansen, Ann Coe, 1985, Geologic Map of Wyoming: U.S. Geological Survey.

Man-made fill is present on-site as previously discussed. Delineation between fill and in-situ soils was difficult. Whether the on-site fill contains significant amounts of debris is unknown, although very little debris was noted in the retrieved samples. The exact extents, limits, and composition of any man-made fill were not determined as part of the scope of work addressed by this study, and should be expected to exist at varying depths and locations.

Silt/Clay contained fine grained sand and was occasionally gravelly, had nijl to high plasticity, was medium stiff to very stiff, moist, brown to light brown in color and occasionally iron stained and calcareous.

Sand contained fine to medium grained sand and was occasional gravelly, had nil to low plasticity, was slightly moist to moist, loose to medium dense, and was brown to light brown in color.

Claystone Bedrock was sandy with fine grained sand, had medium to high plasticity, was hard, dry to slightly moist, dark brown and occasionally iron stained.

Swell-consolidation testing suggested a low potential for heave and low to moderate potential for consolidation in the tested soils samples. A swell of 1.6 percent and consolidations of approximately 0.4 to 3.5 percent were measured against 1,000 psf surcharge pressures after wetting. A sample of tested bedrock exhibited a moderate potential for swell, approximately 3.3 percent, after wetting under a 1,000 psf surcharge pressure.

Groundwater was not encountered at the time of drilling and the test holes were backfilled upon the completion of drilling. However, groundwater levels can be expected to fluctuate over time in response to annual and longer-term cycles of precipitation, irrigation, surface drainage, nearby water features, land use, and the development of transient, perched water conditions.

SEISMIC CLASSIFICATION

Based on extrapolation to depth of the subsurface data obtained for this study, and our experience in the project area, GROUND estimates that the site will meet the characteristics of a Site Class D site, according to the 2006/2009 IBC classification (Table 1613.5.2). To determine the site class quantitatively would require drilling and

testing to a depth of at least 100 feet. We estimate the likelihood of achieving Site Class higher than D to be low. GROUND can provide a proposal for this additional service upon request.

Based on the site coordinates, the USGS's Earthquake Ground Motion Tool v.5.0.9a indicates an S_{DS} value of 0.370 g and an S_{D1} value of 0.123 g.

RADON

Radon is a naturally occurring, colorless, odorless, radioactive gas that can cause lung cancer, according to the U.S. Environmental Protection Agency (EPA). The occurrence of radon is difficult to predict, and structures with all types of foundations can be affected by radon build up. Where radon is allowed to concentrate in an enclosed structure represents a potential hazard. It is not a hazard that can be mitigated by geotechnical measures, however.

Testing for the possible presence of radon gas prior to project development does not yield useful results regarding the potential accumulation of radon in completed structures. Radon accumulations most typically are found in basements, crawl spaces or other enclosed portions of buildings built in areas underlain at relatively shallow depths by granitic crystalline rock. Additional information regarding radon and radon-resistant building design can be obtained from the EPA (e.g., www.epa.gov/radon) as well as from many local building and/or health departments.

GROUND recommends that radon testing be performed in each building, after construction is completed. However, we understand that incorporating sufficient ventilation and other measures into a structure to address radon accumulation during construction is significantly less costly than installing them after construction has been completed. We recommend that the Architect consider radon mitigative measures for the proposed structures and incorporate appropriate systems into the design.

GEOTECHNICAL CONSIDERATIONS FOR DESIGN

Based on the subsurface conditions and laboratory data, we anticipate the primary source of post-construction, potentially damaging, structural movements to be settlement related. Although, a moderate potential exists for heave in the on-site bedrock, we estimate it appears to be deep enough to present little risk of post-construction swell.

However the overburden soils, much of which may be old fill, appears to present a low to moderate risk of post-construction settlements. These settlements will be directly related to subsurface moisture increases following the completion of construction. In residential construction, where landscaping consists of irrigated grass, subsurface moisture increases are inevitable.

We estimate post construction settlements due to post-construction subsurface moisture increases to range from approximately ½ inch up to 2 inches. Were the residential development to utilize xeriscaping, we estimate settlements due to post-construction subsurface moisture increases would be more on the order of ½ inch or less. However based on the location of the development and similar construction in the area, we assume for the purposes of this report that landscaping will consist of irrigated grass. Given the gently to moderately rolling original topography, variable thicknesses and ages of fill (the older fill has had more time to settle than the newer fill, and different levels of performance should be anticipated for differently aged fills under the same loading conditions) imply that these amounts of movement may be differential over comparatively short horizontal distances. Up to 1.5 inches of post-construction differential settlement should be anticipated across each residence.

The following recommendations are intended to minimize the potential settlements if the magnitudes of movement described above are not acceptable.

Recommendations to Reduce Settlements Due to Structural Loading: We also recommend the use of as low a bearing pressure as possible to minimize the amount of settlement related to structural loading. The allowable bearing capacity will be somewhat low anyway due to highly variable soil strength conditions with blow counts ranging from 6/12 to 37/12 in the overburden soils, which also implies the soils are susceptible to differential settlements irrespective of variable fill thickness and age conditions.

To improve and to provide more uniform bearing conditions, it would be beneficial to remove, properly moisture condition, mix, and recompact a uniform 3 foot depth of fill below footings. Such a fill section should extend 3 feet beyond the edges of the footings. At a minimum, we recommend foundation excavation observation for each lot, prior to concrete form placement, by a quality assurance representative to identify areas of loose or soft materials that should be removed and replaced on a case by case basis.

Loose or soft soils should be removed to firm materials or to a depth of 3 feet, whichever is less. Where soft and loose materials extend beyond three feet, the subgrade should be stabilized prior to fill replacement. Stabilization may consist of the placement of a geosynthetic to a minimum of 3 feet beyond the edges of the footings and soft/loose areas. Geotextile fabric is recommended in areas of fine grained soils, and biaxial geogrid is recommended for granular soils. Geosynthetics should have a Minimum Average Roll Value (MARV) ultimate strength of 2,200 lbs/ft in both the machine and cross machine directions.

The allowable bearing capacity is defined as 1-inch of settlement in response to loading. Reducing the bearing pressure below the allowable maximum also reduces the associated settlement. Roughly ½ of the settlement should be realized for loads at ½ of the maximum allowable bearing pressure. As such, over sizing the footing may be prudent for these residences.

Recommendations to Reduce Settlement Due to Post-Construction Moisture Increases: To reduce the risk of settlement related to post-construction moisture increases, we recommend providing excellent surface and subsurface drainage. However, permanent site slopes should be limited to maximum 3(H) : 1(V) for stability and maintenance considerations. If irrigated grass is included in landscaping, we recommend limiting the amount as much as possible. A 10 foot buffer of landscaping not requiring irrigation should be provided around the residences, and down spouts should discharge beyond this zone. In no case should downspouts discharge/terminate below ground.

Our experience with mass grading of gently to moderately rolling topography has been that where drains are not provided in the bottom of natural drainages prior to fill placement, these areas tend to develop perched groundwater conditions and saturated fill conditions resulting in potentially exacerbated settlements. As previously discussed, we understand a storm sewer was installed in the bottom of the drainage located east of the edge of Phase I prior to the newer fill placement. The bottom of the drainage appears to be located slightly west of the middle of Phase II. Where natural drainages were not provided with drains, it would be beneficial to provide them during construction of the utility infrastructure. Where drains do not exist and are not installed, we recommend siting residences as far away from the bottom of natural drainages within the lots as possible.

FOUNDATION SYSTEMS

According to our laboratory analysis, a low to moderate potential for consolidation/settlement exists within the on-site soils. To use these recommendations, the Owner and future homebuyer must accept the risk of post-construction foundation movement as previously discussed associated with shallow foundation systems placed on the on-site soils.

The design and construction criteria presented below should be observed for a spread footing foundation system. The recommendations should be considered when preparing project documents and construction details. The precautions and recommendations provided below will not prevent movement of the footings if the underlying materials are subjected to alternate wetting and drying cycles. However, the recommended measures will tend to make the movement more uniform, and reduce resultant damage if such movement occurs.

1) Footings bearing on 3 feet of removed and replaced properly compacted on-site soils may be designed for an allowable bearing pressure (Q) of 1,500 psf to realize post-construction settlement potentials of approximately up to 1.5 inches. Footings bearing on a minimum of 8 to 12 inches of scarified and properly compacted on-site soils may be design for an allowable bearing pressure of 1,200 psf to realize post-construction settlement potentials of up to 2 inches. The recommended allowable bearing pressures were based on an assumption of drained conditions. If foundation materials are subjected to fluctuations in moisture content, the effective bearing capacity may be reduced, settlements may occur, and larger post-construction movements may result.

2) Footing excavation bottoms may expose loose, organic or otherwise deleterious materials, including debris. Previously processed footing subgrade materials may be disturbed by the excavation process. All such unsuitable materials should be excavated as identified by a quality assurance representative during the foundation excavation observation and replaced with properly compacted fill as discussed in the *Geotechnical Considerations for Design* section.

3) In order to reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded

footings will settle differentially. Similarly, differential fill thicknesses beneath footings will result in increased differential settlements.

4) At locations where the foundation is stepped more than a few feet, we recommend more heavily reinforced foundation walls, as our experience indicates these areas are prone to cracking due to different performance/movement from levels at differing elevations, which while usually not significant from a structural standpoint, tends to be reflected into drywall and other brittle finishes.

5) Spread footings should have a minimum footing dimension of 14 or more inches. Actual footing dimensions, however, should be determined by the Structural Engineer, based on the design loads.

6) Footings should be provided with adequate soil cover above their bearing elevation for frost protection. Footings should be placed at a bearing elevation 3.5 or more feet below the lowest adjacent exterior finish grades.

7) Continuous foundation walls should be reinforced top and bottom to span an unsupported length of at least 10 feet.

8) The lateral resistance of spread footings will be developed as sliding resistance of the footing bottoms on the foundation materials and by passive soil pressure against the sides of the footings. Sliding friction at the bottom of footings may be taken as 0.33 times the vertical dead load on the on-site soils.

9) Compacted fill placed against the sides of the footings should be compacted to at least 95 percent relative compaction in accordance with the recommendations in the *Project Earthwork* section of this report.

10) Care should be taken when excavating the foundations to avoid disturbing the supporting materials. Hand excavation or careful backhoe soil removal may be required in excavating the last few inches.

11) All footing areas should be compacted with a vibratory plate compactor or jumping jack style compactor prior to placement of concrete.

12) The Civil Design Engineer(s) and contractor should evaluate the possible sources of water in the project area over the life of the structure, and provide a design/construction agenda that minimizes the amount of moisture that infiltrates the foundation/structure supporting materials before, during, or after construction.

FLOOR SYSTEMS

The site soils appear suitable for slab-on-grade floors with estimated similar magnitudes of post-construction subsurface moisture increase related settlements to the foundations. Settlements with regard to increased loads will be minimal. The following measures are recommended to reduce damage, which may result from movement of slab-on-grade subgrade materials. These measures will not eliminate potential movements. We estimate that potential slab movements will be similar to that of foundations.

1) A slab-on-grade floor should bear on 3 feet of removed and replaced soils, or a minimum of 8 to 12 inches of scarified on-site soils, with magnitudes of movement similar to the footings as described in the *Foundation Systems* section.

2) Floor slabs should be adequately reinforced. Floor slab design, including slab thickness, concrete strength, jointing, and slab reinforcement should be developed by a structural engineer.

3) An allowable vertical modulus of subgrade reaction (Kv) of 48 tcf (56 pci) may be used for design of a concrete, slab-on-grade floor bearing on the on-site fill or soils.

4) Floor slabs should be separated from all bearing walls and columns with slip joints, which allow unrestrained vertical movement.

   Slip joints should be observed periodically, particularly during the first several years after construction. Slab movement can cause previously free-slipping joints to bind. Measures should be taken to assure that slab isolation is maintained in order to reduce the likelihood of damage to walls and other interior improvements.

5) Concrete slabs-on-grade should be provided with properly designed control joints.

ACI, AASHTO and other industry groups provide guidelines for proper design and construction concrete slabs-on-grade and associated jointing. The design and construction of such joints should account for cracking as a result of shrinkage, curling, tension, loading, and curing, as well as proposed slab use. Joint layout based on the slab design may require more frequent, additional, or deeper joints, and should reflect the configuration and proposed use of the slab.

Particular attention in slab joint layout should be paid to areas where slabs consist of interior corners or curves (e.g., at column blockouts or reentrant corners) or where slabs have high length to width ratios, significant slopes, thickness transitions, high traffic loads, or other unique features. The improper placement or construction of control joints will increase the potential for slab cracking.

6) Interior partitions resting on floor slabs should be provided with slip joints so that if the slabs move, the movement cannot be transmitted to the upper structure. This detail is also important for wallboards and doorframes. Slip joints, which will allow 2 or more inches of vertical movement, should be considered. If slip joints are placed at the tops of walls, in the event that the floor slabs move, it is likely that the wall will show signs of distress, especially where the floors and interior walls meet the exterior wall.

7) Post-construction heave/settlements may not displace slab-on-grade floors and utility lines in the soils beneath them to the same extent. Design of floor penetrations, connections and fixtures should accommodate up to 2 inches of differential movement.

8) Moisture can be introduced into a slab subgrade during construction and additional moisture will be released from the slab concrete as it cures. GROUND recommends placement of a properly compacted layer of free-draining gravel, 4 or more inches in thickness, beneath the slabs. This layer will help distribute floor slab loadings, ease construction, reduce capillary moisture rise, and aid in drainage.

The free-draining gravel should contain less than 5 percent material passing the No. 200 Sieve, more than 50 percent retained on the No. 4 Sieve, and a maximum particle size of 2 inches.

The capillary break and the drainage space provided by the gravel layer also may reduce the potential for excessive water vapor fluxes from the slab after construction as mix water is released from the concrete.

We understand, however, that professional experience and opinion differ with regard to inclusion of a free-draining gravel layer beneath slab-on-grade floors. If these issues are understood by the owner and appropriate measures are implemented to address potential concerns including slab curling and moisture fluxes, then the gravel layer may be deleted.

9) A vapor barrier beneath a building floor slab can be beneficial with regard to reducing exterior moisture moving into the building, through the slab, but can retard downward drainage of construction moisture. Uneven moisture release can result in slab curling. Elevated vapor fluxes can be detrimental to the adhesion and performance of many floor coverings and may exceed various flooring manufacturers' usage criteria.

Per the 2006 ACI *Location Guideline*, a vapor barrier is required under concrete floors when that floor is to receive moisture-sensitive floor covering and/or adhesives, or the room above that floor has humidity control.

Therefore, in light of the several, potentially conflicting effects of the use vapor-barriers, the owner and the architect and/or contractor should weigh the performance of the slab and appropriate flooring products in light of the intended building use, etc., during the floor system design process and the selection of flooring materials. Use of a plastic vapor-barrier membrane may be appropriate for some building areas and not for others.

In the event a vapor barrier is utilized, it should consist of a minimum 15 mil thickness, extruded polyolefin plastic (no recycled content or woven materials), maintain a permeance less than 0.01 perms per ASTM E-96 or ASTM F-1249, and comply with ASTM E-1745 (Class "A"). Vapor barriers should be installed in accordance with ASTM E-1643.

Polyethylene ("poly") sheeting (even if 15 mils in thickness which polyethylene sheeting commonly is not) does not meet the ASTM E-1745 criteria and is not recommended for use as vapor barrier material. It can be easily torn and/or punctured, does not possess necessary tensile strength, gets brittle, tends to decompose over time, and has a relatively high permeance.

Construction Recommendations for Slab-on-Grade Floors

10) Loose, soft or otherwise unsuitable materials exposed on the prepared surface on which the floor slab will be cast should be excavated and replaced with properly compacted fill.

11) The fill section beneath a slab should be of uniform thickness. Where existing, fill soils are encountered and re-worked (See the *Project Earthwork* section of this report.) a fill section thicker than that selected may result. The increased section thickness should be constructed beneath the entire slab.

12) Concrete floor slabs should be constructed and cured in accordance with applicable industry standards and slab design specifications.

13) All plumbing lines should be carefully tested before operation. Where plumbing lines enter through the floor, a positive bond break should be provided.

WATER-SOLUBLE SULFATES

The concentration of water-soluble sulfates measured in sample retrieved from the test hole TH-1 was approximately 0.18 percent by weight (Table 1). Such a concentration of water-soluble sulfates represents a moderate environment for sulfate attack on concrete exposed to these materials. Degrees of attack are based on the scale of 'negligible,' 'moderate,' 'severe' and 'very severe' as described in the "Design and Control of Concrete Mixtures," published by the Portland Cement Association (PCA).

Based on our test results and PCA guidelines, GROUND recommends use of sulfate-resistant cement in all concrete exposed to site soil, conforming to one of the following Class 1 requirements:

(1) ASTM C 150 Type II or V; Class C fly ash shall not be substituted for cement.

(2) ASTM C 595 Type IP(MS) or IP(HS); Class C fly ash shall not be substituted for cement.

(3) ASTM C 1157 Type MS or HS; Class C fly ash shall not be substituted for cement.

(4) When ASTM C 150 Type III cement is allowed, as in Class E concrete, it shall have no more than 8 percent C_3A. Class C fly ash shall not be substituted for cement.

When fly ash is used to enhance sulfate resistance, it shall be used in a proportion greater than or equal to the proportion tested in accordance to ASTM C 1012, shall be the same source and it shall have a calcium oxide content no more than 2.0 percent greater than the fly ash tested according to ASTM C 1012.

In addition, all concrete used should have a minimum compressive strength of 4,000 psi.

The contractor should be aware that certain concrete mix components affecting sulfate resistance including, but not limited to, the cement, entrained air, and fly ash, can affect workability, set time, and other characteristics during placement, finishing and curing. The contractor should develop mix(es) for use in project concrete which are suitable with regard to these construction factors, as well as sulfate resistance. A reduced, but still significant, sulfate resistance may be acceptable to the owner, in exchange for desired construction characteristics.

SOIL CORROSIVITY

Soil Resistivity In order to assess the "worst case" for mitigation planning, a sample of material retrieved from the test hole was tested for resistivity in the laboratory, after being saturated with water, rather than at the as-received moisture content. Resistivity also varies inversely with temperature. Therefore, the laboratory measurements were made at a controlled temperature.

A measurement of electrical resistivity indicated a value of approximately 184 ohm-centimeters in a selected sample of retrieved soil, which represents a highly corrosive environment for buried metals based on ASM ratings. The following table presents the relationship between resistivity and a qualitative corrosivity rating[2]:

[2] ASM International, 2003, *Corrosion: Fundamentals, Testing and Protection,* ASM Handbook, Volume 13A.

Corrosivity Ratings Based on Soil Resistivity

Soil Resistivity (ohm-cm)	Corrosivity Rating
>20,000	Essentially non-corrosive
10,000 – 20,000	Mildly corrosive
5,000 – 10,000	Moderately corrosive
3,000 – 5,000	Corrosive
1,000 – 3,000	Highly corrosive
<1,000	Extremely corrosive

pH Where pH is less than 4.0, soil serves as an electrolyte; the pH range of about 6.5 to 7.5 indicates soil conditions that are optimum for sulfate reduction. In the pH range above 8.5, soils are generally high in dissolved salts, yielding a low soil resistivity[3]. Testing indicated a pH value of approximately 8.2.

The water-soluble sulfate, pH, and resistivity results (Table 1) may be used to generate Corrosion Resistance (CR) numbers to evaluate corrosion potential and the associated acceptability/recommendations for both concrete and metallic materials in contact with project area soils based on WYDOT criteria. An example of the WYDOT Corrosion Resistance Table is presented on Table 2, however we recommend contacting WYDOT to verify use of the most up to date version. WYDOT recommendations for culvert and storm drain concrete and metallic corrosion protection can also be found in the Standard Specifications for Road and Bridge Construction on Table 603.4.2-1 Corrosion Resistance Acceptability. We also recommend the specifications for corrosion protection of metallic piping and fittings conform to Division 500, Section 503 of the City of Casper Standard Specifications for Public Works and Infrastructure Improvements.

If additional information or recommendations are needed regarding soil corrosivity, GROUND recommends contacting WYDOT Geology, the City of Casper, or a corrosion engineer. However, it should be noted that changes to the site conditions during construction, such as the import of other soils, or the intended or unintended introduction of off-site water, may alter corrosion potentials significantly.

[3] American Water Works Association ANSI/AWWA C105/A21.5-05 Standard

LATERAL EARTH PRESSURES

Structures which are laterally supported and can be expected to undergo only a limited amount of deflection, i.e., an "at-rest" condition, should be designed to resist lateral earth pressures computed on the basis of an equivalent fluid unit weight of 73 pounds per cubic foot (pcf) where on-site materials are placed as backfill.

Structures designed to deflect sufficiently to mobilize the full, active earth pressure condition may be designed for an active lateral earth pressure computed on the basis of an equivalent fluid unit weight of 51 pcf where the backfill consists of on-site materials. Passive earth pressure may be computed on an allowable equivalent fluid unit weight of 220 pcf where backfill consists of on-site materials. The upper 1 foot of materials should be ignored in passive pressure calculations.

The parameters recommended above assume well drained conditions behind retaining structures based on a properly functioning wall drain system and a horizontal backfill surface. Wall design should incorporate any upward sloping backfills, dead and live loads such as construction equipment, vehicular traffic, material stockpiles, etc., and other surcharge pressures. The build-up of hydrostatic pressures behind a wall will also increase lateral earth pressures on the walls.

The above parameters are not recommended for use in retaining wall design. In the event that retaining walls are added once development begins, retaining wall parameters should be requested and the client should realize that additional subsurface exploration may be necessary.

PROJECT EARTHWORK

The following information is for private improvements; public roadways or utilities should be constructed in accordance with applicable municipal / agency standards.

General Considerations: Site grading and backfill of utility trenches and foundations should be performed as early as possible in the construction sequence to allow settlement of fills and surcharged ground to be realized to the greatest extent prior to subsequent construction.

Prior to earthwork construction, existing structures, vegetation and other deleterious materials should be removed and disposed of off-site. Relic underground utilities should be abandoned in accordance with applicable regulations, removed as necessary, and properly capped.

Topsoil present on-site should not be incorporated into ordinary fills. Instead, topsoil should be stockpiled during initial grading operations for placement in areas to be landscaped or for other approved uses.

Existing Fill Soils: Existing fill encountered during construction may or may not be suitable in general for use as re-compacted on-site fill depending on the amount of trash, organic debris, and deleterious content it contains. Fill should be evaluated during project excavations by quality assurance/control representatives whenever a question of acceptability is encountered.

Imported Fill Materials: If it is necessary to import fill material to the site, the imported soils should be free of organic material, and other deleterious materials. Imported material should at a minimum consist of soils that have less than 75 percent passing the No. 200 Sieve, and should have a plasticity index less than 15. We recommend that claystone not be imported. Representative samples of the materials proposed for import should be tested and approved by the Geotechnical Engineer prior to transport to the site.

Fill Platform Preparation: Prior to filling, the excavation should be observed by a Geotechnical Engineer. The top 8 to 12 inches of in-place materials on which fill soils will be placed should be scarified, moisture conditioned and properly compacted in accordance with the recommendations below to provide a uniform base for fill placement.

If surfaces to receive fill expose loose, wet, soft or otherwise deleterious material, additional material should be excavated, or other measures should be taken to establish a firm platform for filling. Such measures may include crowding of crushed rock into subgrade material and/or the use of biaxial geofabric or geogrids. The surfaces to receive fill must be effectively stable prior to placement of fill.

Fill Placement: Fill materials should be thoroughly mixed to achieve a uniform moisture content, placed in lifts not exceeding 8 inches in loose thickness, and properly

compacted. We recommend fill material be placed at a moisture content of approximately 2 percent below to 2 percent above the optimum moisture content and compacted to a minimum of 95 percent of the standard Proctor (ASTM D698).

No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions. Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction.

Use of Squeegee: Relatively uniformly graded fine gravel or coarse sand, i.e., "squeegee" or "pea gravel", or similar materials are commonly proposed for backfilling foundation excavations, utility trenches (excluding approved pipe bedding), and other areas where employing compaction equipment is difficult. In general, GROUND does not recommend this procedure for the following reasons:

Although commonly considered "self compacting," uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are highly permeable to free-draining and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

GROUND recommends that wherever possible, excavations be backfilled with approved, on-site soils placed as properly compacted fill. Where this is not feasible, use of "Controlled Low Strength Material" (CLSM), i.e., a lean, sand-cement slurry ("flowable fill") or a similar material for backfilling should be considered.

Where "squeegee", "pea gravel" or similar materials are proposed for use by the contractor, the design team should be notified by means of a Request for Information (RFI), so that the proposed use can be considered on a case-by-case basis. Where "squeegee" or "pea gravel" meets the project requirements for pipe bedding material, however, it is acceptable for that use.

Settlements: Settlements with regard to newly placed fills will occur, typically on the order of 1 to 2 percent of the fill depth. If fill placement is performed properly and is

tightly controlled, in GROUND's experience the majority (on the order of 60 to 80 percent) of that settlement will typically take place during earthwork construction, provided the contractor achieves the compaction levels recommended herein. The remaining potential settlements will likely take several months or longer to be realized, and may be exacerbated if these fills are subjected to changes in moisture content.

Cut and Filled Slopes: We recommend permanent site slopes supported by on-site soils up to 20 feet in height be constructed no steeper than 3:1 (horizontal : vertical). Minor raveling or surficial sloughing should be anticipated on slopes cut at this angle until vegetation is well re-established. Surface drainage should be designed to direct water away from slope faces, crests and toes.

EXCAVATION RECOMENDATIONS

The test holes for the subsurface exploration were excavated to the depths indicated by means of truck-mounted, continuous flight auger drilling equipment. Relatively very hard bedrock is located at a depth of 30 feet below the ground surface in test hole TH-1. Therefore, we anticipate no unusual difficulties for shallow excavations with heavy duty excavation equipment in good working order.

We recommend temporary, un-shored excavation slopes up to 20 feet in height be cut no steeper than 1.5 (H) to 1 (V) in the on-site soils in the absence of seepage. Some surface sloughing may occur on the slope faces at these angles. Slopes greater than 20 feet in height should be analyzed for stability by a Professional Engineer per OSHA requirements. Groundwater is not anticipated to be a significant factor for earthworks during construction of this project. If seepage or flowing groundwater is encountered in shallow project excavations, slopes should be flattened as necessary to maintain stability, and/or dewatered. The risk of slope instability will be significantly increased in areas of seepage along excavation slopes.

Should site constraints prohibit the use of the recommended slope angles, temporary shoring should be used. The shoring should be designed to resist the lateral earth pressure exerted by structure, traffic, equipment, and stockpiles. GROUND can provide shoring design upon request.

Good surface drainage should be provided around temporary excavation slopes to direct surface runoff away from the slope faces, crests and toes. A properly designed swale

should be provided at the top of the excavations. In no case should water be allowed to pond at the site. Slopes should be protected against erosion. Erosion along the slopes will result in sloughing and could lead to a slope failure. Any excavations in which personnel will be working must comply with all OSHA Standards and Regulations (CFR 29 Part 1926). The contractor's "responsible person" should evaluate the material exposed in the excavations as part of the contractor's safety procedures. GROUND has provided the information above solely as a service to the client, and is not assuming responsibility for construction site safety or the contractor's activities.

UTILITY INSTALLATION AND BACKFILLING

Excavation bottoms may expose soft, loose or otherwise deleterious materials, including debris. Firm materials may be disturbed by the excavation process. All such unsuitable materials should be excavated and replaced with properly compacted fill or stabilized prior to fill placement. Areas allowed to pond water will require excavation and replacement with properly compacted fill. The contractor should take particular care to ensure adequate support near pipe joints which are less tolerant of extensional strains.

Where thrust blocks are needed, they may be designed for an allowable passive soil pressures as indicated in the *Lateral Earth Pressure* section. We recommend the upper 1 foot of soil be ignored in passive pressure calculations. Additionally, care should be taken when relying on passive pressure where the soil surface slopes down into the passive pressure wedge. Sliding friction at the bottom of thrust blocks may also be taken as indicated in the *Lateral Earth Pressure* section multiplied by the vertical dead load.

Trench Backfilling: Some settlement of compacted soil trench backfill materials should be anticipated, even where all the backfill is placed and compacted correctly. Typical settlements are on the order of 1 to 2 percent of fill thickness. However, the need to compact to the lowest portion of the backfill must be balanced against the need to protect the pipe from damage from the compaction process. Some thickness of backfill may need to be placed at compaction levels lower than recommended or specified (or smaller compaction equipment used together with thinner lifts) to avoid damaging the pipe. Protecting the pipe in this manner can result in somewhat greater surface settlements. Therefore, although other alternatives may be available, the following options are presented for consideration:

Controlled Density Backfill: Because of these limitations, we recommend backfilling the entire depth of the trench (both bedding and common backfill zones) with Controlled Density Backfill material (CDB), i.e., a lean, sand-cement slurry, "flowable fill," or similar material along all trench alignment reaches with low tolerances for surface settlements.

We recommend that CDB used as pipe bedding and trench backfill conform to the specifications of Division 200, Section 205 of the City of Casper Standard Specifications for Public Works and Infrastructure Improvements.

Placement of the CDB in several lifts or other measures likely will be necessary to avoid 'floating' the pipe. Measures also should be taken to maintain pipe alignment during CDB placement.

Compacted Soil Backfilling: Where compacted soil backfilling is employed, using the site soils or similar materials as backfill, the risk of backfill settlements entailed in the selection of this higher risk alternative must be anticipated and accepted by the Client/Owner.

Soils placed for compaction as trench backfill should be conditioned to a relatively uniform moisture content, placed and compacted in accordance with the recommendations for encasement material and select on-site trench backfill as outlined in Division 200, Section 205.11 of the City of Casper Standard Specifications.

Pipe Bedding: Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. Bedding should be brought up uniformly on both sides of the pipe to reduce differential loadings.

As discussed above, we recommend the use of CDB or similar material in lieu of granular bedding and compacted soil backfill where the tolerance for surface settlement is low (Placement of CDB as bedding to at least 12 inches above the pipe can protect the pipe and assist construction of a well-compacted conventional backfill, although possibly at an increased cost relative to the use of conventional bedding).

If a granular bedding material is specified, GROUND recommends that with regard to potential migration of fines into the pipe bedding, design and installation follow Appendix Section X1.8 of ASTM D2321. If the granular bedding does not meet filter criteria for the enclosing soils, then non-woven filter fabric (e.g., Mirafi® 140N, or the equivalent) should

be placed around the bedding to reduce migration of fines into the bedding which can result in severe, local surface settlements. Where this protection is not provided, settlements can develop/continue several months or years after completion of the project. In addition, clay or concrete cut-off walls or "trench plugs" should be installed to interrupt the granular bedding section to reduce the rates and volumes of water transmitted along the utility alignments which can contribute to migration of fines. Cut-off walls should be considered for each service as they enter the lots.

If granular bedding is specified, the contractor should anticipate that significant volumes of on-site soils may not be suitable for that use. Materials proposed for use as pipe bedding should be tested by a geotechnical engineer for suitability prior to use. Imported materials should be tested and approved by a geotechnical engineer prior to transport to the site.

EXTERIOR FLATWORK AND DRIVEWAYS

Flatwork We anticipate that the exteriors of proposed buildings and other portions of the site will be provided with concrete flatwork. Like other site improvements, flatwork will experience post-construction movements as soil moisture contents increase after construction and distress will likely result. The following measures will help to reduce damages to these improvements:

1) The subgrade beneath project sidewalks, paved entryways and patios, masonry planters and short, decorative walls, and other flatwork should be excavated and/or scarified to a depth of at least 8 to 12 inches, moisture-conditioned and properly re-compacted.

2) Prior to placement of flatwork, a proof roll should be performed to identify areas that exhibit instability and deflection. Unstable soils in these areas should be removed and replaced with properly compacted fill. The contractor should take care to achieve and maintain compaction behind curbs to reduce differential sidewalk settlements. As in the case of pavements, passing a proof roll is an additional requirement to placing and compacting the subgrade fill soils within the recommended ranges of moisture content and relative compaction in the *Subgrade Preparation* section of this report. Subgrade stabilization such as the use of geosythetics, "crowding" crushed rock, or other measures may be

necessary to achieve a firm subgrade, particularly where subgrade moisture contents are high enough to result in pumping during proof-rolling.

3) Flatwork should be provided with control joints extending to an effective depth and spaced no more than 10 feet apart, both ways. Narrow flatwork, such as sidewalks, likely will require more closely spaced joints.

4) In no case should exterior flatwork extend to under any portion of the building where there is less than 6 inches of vertical clearance between the flatwork and any element of the building. Exterior flatwork in contact with brick, rock facades, or any other element of the building can cause damage to the structure if the flatwork experiences movements.

Construction and Drainage Between Buildings and Pavements Proper design, drainage, construction and maintenance of the areas between individual buildings and parking/driveway areas are critical to the satisfactory performance of the project. Inadequate compaction of foundation wall backfill can result in poor flatwork performance in areas adjacent to buildings. Poorly compacted foundation wall backfill often results in settlement of slabs, drainage decreases and concentrated surface drainage is introduced into the backfill adjacent to the building, which often results in heave of underyling soils on swelling soil sites and exacerbated settlement for consolidation prone sites. Such movements can adversely affect shallowly founded buildings and slabs-on-grade. Therefore, GROUND recommends that the contractor take particular care with regard to proper wall backfill placement and subgrade preparation in the immediate building exteriors.

Frost and Ice Considerations Nearly all soils other than relatively coarse, clean, granular materials are susceptible to loss of density if allowed to become saturated and exposed to freezing temperatures and repeated freeze – thaw cycling. The formation of ice in the underlying soils can result in heaving of pavements, flatwork and other hardscaping ("ice jacking") in sustained cold weather of 2 inches or more. This heaving can develop relatively rapidly. A portion of this movement typically is recovered when the soils thaw, but due to loss of soil density some degree of displacement typically will remain. This can result even where the subgrade soils were prepared properly.

Where hardscape movements are a design concern, e.g., at doorways, replacement of the subgrade soils with 3 or more feet of clean, coarse sand or gravel with a drain should be considered, or the element should be supported on foundations similar to the building

and spanning over a void. Detailed recommendations in this regard can be provided upon request. It should be noted that where such open graded granular soils are placed, water can infiltrate and accumulate in the subsurface relatively easily, which can lead to increased settlement or heave from factors unrelated to ice formation. The relative risks from these soil conditions should be taken into consideration where ice jacking is a concern. GROUND will be available to discuss these concerns upon request.

Concrete Scaling Surface scaling of sidewalks and other exterior concrete can result from poor workmanship during construction, such as 'over-finishing' the surface. It also can result from exposure to relatively severe weather conditions with repeated freeze-thaw cycles. In GROUND's experience, if reducing the potential for freeze-thaw scaling is a design consideration, the following measures are beneficial: a) maintaining a maximum water/cement ratio of 0.45 by weight for exterior concrete, b) including Type F fly ash in the mix for exterior concrete as 20 percent of the cementitious material, and c) use of exterior concrete that exhibits a minimum compressive strength of 4,500 psi. Inclusion of 'fibermesh' in the concrete mix also may be beneficial for reducing surficial scaling. (These concrete mix design criteria should be coordinated with other project requirements including the criteria for sulfate resistance presented in the *Water-Soluble Sulfates* section of this report.) In addition, the use of de-icing salts on exterior concrete flatwork during the first winter after construction will increase the likelihood of the development of scaling. Placement of flatwork concrete during cold weather so that it is exposed to freeze-thaw cycling before it is fully cured also increases its vulnerability to scaling. Concrete placing during cold weather conditions should be blanketed or tented to allow full curing. Depending on the weather conditions, this may result in 3 to 4 weeks of curing, and possibly more.

Driveway Generally, we recommend concrete driveway pavements consist of a plant mix composed of a mixture of aggregate, Portland cement and appropriate admixtures meeting the requirements of a job-mix formula established by a qualified engineer as well as applicable design requirements as specified by the City of Casper. Concrete should have a minimum modulus of rupture of third point loading of 650 psi. Normally, concrete with a 28-day compressive strength of 4,500 psi should develop this modulus of rupture value. We recommend the concrete be air-entrained with approximately 6 percent air and have a minimum cement content of 6 sacks per cubic yard. We also recommend a maximum allowable slump of 4 inches.

Concrete pavements should contain sawed or formed joints to ¼ of the depth of the slab at a maximum distance of 10 feet on centers, or in accordance with municipal requirements or as recommended by the Civil Engineer. We also generally recommend that concrete pavement slabs be fully doweled and tied to reduce edge and corner cracking tendencies, however slabs subject to passenger vehicle loadings should perform adequately without tying and doweling if the subgrade is properly prepared prior to concrete placement.

Subgrade Preparation: Shortly before placement of concrete pavement and aggregate base (if used), the exposed subgrade soils should be scarified to a depth at least 8 to 12 inches, mixed to achieve a uniform moisture content and then re-compacted. Subgrade preparation should extend the full width of the pavement and a recommended minimum two feet beyond the pavements. We recommend compaction and moisture specifications for pavement subgrade preparation of a minimum 95% of the standard Proctor ASTM D698 at moisture contents between -2 and +2 percent of the optimum moisture content.

Immediately prior to paving, the subgrade should be proof rolled with a heavily loaded, pneumatic tired vehicle. Areas that show excessive deflection during proof rolling should be excavated and replaced and/or stabilized. Areas allowed to pond prior to paving will require significant re-working prior to proof-rolling.

The use of a minimum of 4 inches of aggregate base will improve concrete driveway pavement performance. We recommend aggregate base material or gravel surfaced driveway material meet specifications as outlined by Division 400 the Pavement Base Course Section 402.02 of the 2006 City of the Casper Standard Specifications for Public Works Construction and Infrastructure Improvements, or the WYDOT Standard Specifications for Road and Bridge Construction. We recommend driveway gravel surfacing be placed to a minimum depth of 8 inches. We recommend driveway base course be placed in uniform lifts not exceeding 6 inches in loose thickness and compacted to at least 95 percent of the maximum dry density and uniform moisture contents within -4 to +2 percent of the optimum as determined by ASTM D698 / AASHTO T-99, the "standard Proctor."

Additional Observations: The collection and diversion of surface drainage away from paved areas is extremely important to satisfactory performance of pavements. The

subsurface and surface drainage systems should be carefully designed and constructed to ensure removal of water from paved areas and subgrade soils. Allowing surface waters to pond on pavements will cause premature pavement deterioration. Where topography, site constraints or other factors limit or preclude adequate surface drainage, pavements should be provided with edge drains to reduce loss of subgrade support. The long-term performance of the pavement can also be greatly improved by proper backfilling and compaction behind curbs, gutters, and sidewalks so that ponding is not permitted and water infiltration is reduced.

Landscape irrigation in planters adjacent to pavements and in "island" planters within paved areas should be carefully controlled or differential heave and/or rutting of the nearby pavements will result. Drip irrigation systems are recommended for such planters to reduce over-spray and water infiltration beyond the planters. Enclosing the soil in the planters with plastic liners and providing them with positive drainage will also reduce differential moisture increases in the surrounding subgrade soils.

SURFACE DRAINAGE

The following drainage measures are recommended for design, construction, and should be maintained at all times after the project has been completed:

1) Wetting or drying of the foundation excavations and underslab areas should be avoided during and after construction as well as throughout the improvements' design life. Permitting increases/variations in moisture to the adjacent or supporting soils may result in a decrease in bearing capacity and an increase in volume change of the underlying soils and/or differential movement.

2) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils. The ground surface surrounding the exterior of each building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 12 inches in the first 10 feet in areas not covered with pavement or concrete slabs, or a minimum 3 percent in the first 10 feet in paved or covered areas. Reducing the slopes to comply with ADA requirements may be necessary, but may result in an increased potential for moisture infiltration and subsequent volume change of the underling soils. In no case should water be allowed to pond near or adjacent to foundation elements.

However, if positive surface drainage is implemented and maintained to direct moisture away from the building, lesser slopes can be utilized.

3) On some sites it is common to have slopes descending toward buildings. Such slopes can be created during grading even on comparatively flat sites. In such cases, even where the recommendation above regarding slopes adjacent to the building is followed, water may flow to and beneath the building with resultant additional post-construction movements. Where the final site configuration includes graded or retained slopes descending toward the building or flatwork, interceptor drains should be installed between the building and the slope. In addition, where irrigation is applied on or above slopes, drainage structures are commonly needed near the toe-of-slope to prevent on-going or recurrent wet conditions.

4) We recommend that in no case should water be permitted to pond adjacent to or on sidewalks, hardscaping, or other improvements as well as utility trench alignments, which are likely to be adversely affected by moisture-volume changes in the underlying soils or flow of infiltrating water.

5) Roof downspouts and drains should discharge well beyond the perimeter of the structure foundations. We recommend minimum downspout extensions of 10 feet

6) We do not recommend any vegetation require watering, but if it is included the following recommendations should help to reduce damage. Vegetation that may require watering should ideally be located 10 or more feet from the building perimeter, flatwork, or other site improvements. As a minimum, vegetation requiring irrigation should not be located within 10-feet of structure perimeters. Irrigation sprinkler heads should be deployed so that applied water is not introduced near or into foundation/subgrade soils. Landscape irrigation outside that 10-foot limit should be limited to the minimum quantities necessary to sustain healthy plant growth.

7) Use of drip irrigation systems can be beneficial for reducing over-spray beyond planters. Drip irrigation can also be beneficial for reducing the amounts of water introduced to foundation/subgrade soils, but only if the total volumes of applied

water are controlled with regard to limiting that introduction. Controlling rates of moisture increase in foundation/subgrade soils should take higher priority than minimizing landscape plant losses.

8) Where plantings are desired within 10 feet of a building, GROUND recommends that the plants be placed in water-tight planters, constructed either in-ground or above-grade, to reduce moisture infiltration in the surrounding subgrade soils. Planters should be provided with positive drainage and landscape underdrains.

9) Plastic membranes should not be used to cover the ground surface adjacent to foundation walls. Perforated "weed barrier" membranes that allow ready evaporation from the underlying soils may be used.

SUBSURFACE DRAINAGE

As a component of project civil design, properly functioning, subsurface drain systems (underdrains, foundation or perimeter drains) can be beneficial for collecting and discharging saturated subsurface waters. Underdrains will not collect water infiltrating under unsaturated (vadose) conditions, or moving via capillarity, however. In addition, if not properly constructed and maintained, underdrains can transfer water into foundation soils, rather than remove it. This will tend to induce heave or settlement of the subsurface soils, and may result in distress. Underdrains can, however, provide an added level of protection against relatively severe post-construction movements by draining saturated conditions near individual structures should they arise, and limiting the volume of wetted soil.

Although inclusion of an underdrain system is common on sites like the subject project, particularly where shallow foundations are used, professional opinion varies regarding the potential benefits relative to the cost. Therefore, the owner and the design team and contractor should assess the net benefit of an underdrain system as a component of overall project drainage.

Given the settlement potential, we recommend upper levels and below-grade or partially below-grade level(s) include an underdrain system. Damp-proofing should be applied to the exteriors of below-grade elements. The provision of Tencate MiraFi® G-Series backing (or comparable wall drain provisions) on the exteriors of (some) below-grade

elements may be appropriate, depending on the intended use. If a (partially) below-grade level is limited in extent, the underdrain system, etc., may be local to that area.

Geotechnical Parameters for Underdrain Design Where an underdrain system is included in project drainage design, it should be designed in accordance with the recommendations below. The actual underdrain layout, outlets, and locations should be developed by a civil engineer.

An underdrain system should be tested by the contractor after installation and after placement and compaction of the overlying backfill to verify that the system functions properly.

1) The underdrain trench should be located outside of a 1(H) : 1(V) slope from the bottom of the footing to avoid undermining soil supporting the footings.

2) An underdrain system for a building should consist of perforated, rigid, PVC collection pipe at least 4 inches in diameter, non-perforated, rigid, PVC discharge pipe at least 4 inches in diameter, free-draining gravel, and filter fabric, as well as a waterproof membrane.

3) The free-draining gravel should contain less than 5 percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. Each collection pipe should be surrounded on the sides and top (only) with 6 or more inches of free-draining gravel.

4) The gravel surrounding the collection pipe(s) should be wrapped with filter fabric (MiraFi 140N® or the equivalent) to reduce the migration of fines into the drain system.

5) The waterproof membrane should underlie the gravel and pipe, and be attached to the foundation stem wall.

6) The underdrain system should be designed to discharge at least 5 gallons per minute of collected water.

7) The high point(s) for the collection pipe flow lines should be at least 2 inches below the bottom of footing. Multiple high points are sometimes necessary for significant building perimeter lengths.

   The collection and discharge pipe for the underdrain system should be laid on a slope sufficient for effective drainage, but a minimum of 2 percent. (Flatter gradients may be used but will convey water less efficiently and entail an increased risk of local post-construction movements.)

   Pipe gradients also should be designed to accommodate at least ½ inch of differential movement after installation along a 40-foot run.

8) Underdrain 'clean-outs' should be provided at intervals of no more than 100 feet to facilitate maintenance of the underdrains. Clean-outs also should be provided at collection and discharge pipe elbows of 60 degrees or more.

9) The underdrain discharge pipes should be connected to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. We suggest that collected waters be discharged directly into the storm sewer system, if possible.

CLOSURE

Geotechnical Review

GROUND should be retained to review project plans and specifications to evaluate whether they comply with the intent of the recommendations in this report. The review should be requested in writing. The geotechnical recommendations presented in this report are contingent upon observation and testing of project earthworks by representatives of GROUND. If another geotechnical consultant is selected to provide materials testing, then that consultant must assume all responsibility for the geotechnical aspects of the project by concurring in writing with the recommendations in this report, or by providing alternative recommendations.

Materials Testing

The client should consider retaining a quality assurance representative, and at a minimum require a quality control representative, to perform materials testing during construction. The performance of such testing or lack thereof, in no way alleviates the burden of the contractor or subcontractor from constructing in a manner that conforms to applicable project documents and industry standards. The contractor or pertinent subcontractor is ultimately responsible for managing the quality of their work; furthermore, testing by the geotechnical engineer does not preclude the contractor from obtaining or providing whatever services they deem necessary to complete the project in accordance with applicable documents.

Limitations

This report has been prepared for the SenergyOne Development, Inc. as it pertains to the development as described herein. It may not contain sufficient information for other parties or other purposes. The owner or any prospective buyer relying upon this report must be made aware of and must agree to the terms, conditions, and liability limitations outlined in the proposal.

In addition, GROUND has assumed that project construction will commence by Winter 2013. Any changes in project plans or schedule should be brought to the attention of the Geotechnical Engineer, in order that the geotechnical recommendations may be re-evaluated and, as necessary, modified.

The geotechnical conclusions and recommendations in this report relied upon subsurface exploration at a limited number of exploration points, as shown in Figure 1, as well as the means and methods described herein. Subsurface conditions were interpolated between and extrapolated beyond these locations. It is not possible to guarantee the subsurface conditions are as indicated in this report. Actual conditions exposed during construction may differ from those encountered during site exploration.

If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, the Geotechnical Engineer should be advised at once, so that re-evaluation of the recommendations may be made in a timely manner. In addition, a contractor who relies upon this report for development of his scope of work or cost estimates may find the geotechnical information in this report to be inadequate for

his purposes or find the geotechnical conditions described herein to be at variance with his experience in the greater project area. The contractor is responsible for obtaining the additional geotechnical information that is necessary to develop his workscope and cost estimates with sufficient precision. This includes current depths to groundwater, etc.

The materials present on-site are stable at their natural moisture content, but may change volume or lose bearing capacity or stability with changes in moisture content. Performance of the proposed structure and pavement will depend on implementation of the recommendations in this report and on proper maintenance after construction is completed. Because water is a significant cause of volume change in soils and rock, allowing moisture infiltration may result in movements, some of which will exceed estimates provided herein and should therefore be expected by the owner.

This report was prepared in accordance with generally accepted soil and foundation engineering practice in the project area at the date of preparation. GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or recommendations contained herein. Because of numerous considerations that are beyond GROUND's control, the economic or technical performance of the project cannot be guaranteed in any respect.

ALL DEVELOPMENT CONTAINS INHERENT RISKS. It is important that ALL aspects of this report, as well as the estimated performance (and limitations with any such estimations) of proposed project improvements are understood by the Client, Project Owner (if different), or properly conveyed to any future owner(s). Utilizing these recommendations for planning, design, and/or construction constitutes understanding and acceptance of recommendations or information provided herein, potential risks, associated improvement performance, as well as the limitations inherent within such estimations. If any information referred to herein is not well understood, it is imperative for the Client, Owner (if different), or anyone using this report to contact the author or a company principal immediately.

Sincerely,
GROUND Engineering Consultants, Inc.

Carl Henderson, P.E.

Reviewed by James B. Kowalsky, P.E.

EXHIBIT "B2" – THREE (3) PAGES
Inberg-Miller Dec. 2014

INBERG-MILLER ENGINEERS

Quality Solutions Through Teamwork

December 17, 2014 17706-CX

3 PDF PAGES BY EMAIL: sgustafson@ecsengineers.net
THIS CONSTITUTES THE ORIGINAL

Mr. Shawn Gustafson, P.E.
ECS Engineers
111 West Second Street Ste 600
Casper, WY 82604

RE: ADDENDUM NO.1 TO OUR SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING REPORT DATED DECEMBER 5, 2014
MESA TOWNHOMES
CASPER, WYOMING

Dear Mr. Gustafson:

The purpose of this addendum is to report additional recommendations per your verbal request on December 11, 2014.

It is our understanding that the owner of the townhomes has requested an alternative foundation to the drilled pier deep foundations recommended in our original report. We further understand that the owner understands that additional vertical movement of the structures is possible if founded on shallow foundations.

At higher risk for vertical movement due to the noted expansive and collapsible fill soils at the site the buildings may be founded on conventional shallow pad and spread footings bearing on a minimum of 4 feet of properly prepared structural fill meeting the WYDOT Grade W gradation specified in the geotechnical report "Earthwork Section". The proposed fill depth is intended to provide a buffer of non-expansive soils between the structure and the native, expansive soils. The 4 feet thick soil buffer is intended to reduce the moisture variation of the underlying soils and to distribute expansive pressures from the underlying formation over a wide area of the structure.

1. The overexcavations should extend horizontally on all sides of the footing a minimum distance equal to the depth of the overexcavation (4 feet minimum). We anticipate that this will require a minimum footing excavation, measured at the bottom of the excavation of 8 feet plus the width of the footing.

2. Spread footings for building columns and continuous footings for bearing walls should be designed for an allowable net bearing pressure of 1,500 psf.

    - Shallow footing widths should be a minimum of 24 inches for individual pads and 18 inches for continuous footings.
    - The allowable net bearing pressure can be increased by one-third for short-term loads such as wind or seismic.

- The above allowable bearing pressure is to be used with foundation reactions from dead and long-term live loads derived by working stress analyses.

3. For frost protection and to provide containment for the bearing soils, exterior footings should extend to a minimum depth of 42 inches below finished exterior grade. Interior footings within heated areas of the building should extend to a minimum depth of 12 inches below the floor subgrade.

4. Footings designed and constructed as recommended in this report may still have total foundation settlements of up to 2 inches and differential movement across the building pads is anticipated to be as much as 3 inches due to the potential for swell and collapse at opposite sides of the structure. Settlement and expansion is often induced by saturation of the foundation subgrade. Therefore, provisions for adequate surface drainage should be made. Where differential settlement may be problematic, consideration should be given to design footing dimensions and loads to produce equal settlement. This effort may include considerations of compressibility of native soil, thickness and compressibility of fill, and distribution of dead load.

   Foundations supported on new fills greater than about 3 feet may experience additional settlement due to settlement of the new fill and the weight of the fill on the subgrade soils.

5. Footing subgrades should be observed by the Geotechnical Engineer prior to concrete placement, to identify suitable bearing materials, and to observe whether the foundation soils have been properly prepared prior to foundation construction. All loose or soft soils in the footing excavation should be removed from the foundation excavation prior to concrete placement. Footings should not be placed on either uncompacted native soil or uncompacted fill.

If structures are supported on shallow foundations positive drainage away from the buildings and pavement areas will be vital to the stability of the structure. In order to reduce the presence of moisture near the structure, landscaping should utilize plants and vegetation adjacent to the building that do not require much irrigation. Furthermore, sprinkler heads should not be placed closer than 10 feet from the structure. It is impossible to overemphasize the importance of this recommendation.

CLOSURE

This addendum has been prepared for the exclusive use of our client, ECS Engineers, for design and construction planning purposes of the described project. By reference, this addendum becomes part of our Subsurface Exploration and Geotechnical Engineering Report dated December 5, 2014 and all other information and recommendations are still valid.

We appreciate participating in your project. If you have any questions, please contact us at 307-577-0806.

Sincerely,

INBERG-MILLER ENGINEERS

Ben Hauser, P.E., G.I.T.
Geotechnical Engineer

REVIEWED BY:

Steven F. Moldt, P.E.
President

BH:SFM:cno\\IME01\Projects\17706-CX ECS ENGINEERING Mesa Townhomes\17706-CX Addendum no.1.docx

EXHIBIT "B3" - FIFTEEN (15) PAGES
Hollingsworth Associates, Inc.

SUBSURFACE STUDY

FOR

FORTY-ONE LOTS AND INTERNAL STREETS

MESA DEL SOL II SUBDIVISION

CASPER, WYOMING

Job No.: 15-336
July 22, 2015

Prepared For:

Environmental & Civil Solutions, LLC
111 West Second Street, Suite 600
Casper, Wyoming 82604

Hollingsworth Associates, Inc.
Geotechnical & Environmental Engineers 2875 W. Oxford Ave. #7 Sheridan, Colorado 80110
303-781-5188/fax 303-781-5224

TABLE OF CONTENTS

SUMMARY AND CONCLUSIONS

1. The subsurface conditions across the forty-one lots were somewhat variable, as indicated by the exploratory borings B-1 through B-21. In borings B-1 through B-6, B-8 through B-16, and B-19 through B-21, the subsurface conditions consisted of zero to 12 inches of topsoil, zero to 13 feet of stiff to very stiff sandy clay, and zero to 9 feet of firm to medium hard weathered claystone overlying hard to very hard claystone for the depth drilled, 21 feet. In borings B-7, B-17, and B-18, the subsurface conditions consisted of zero to 12 inches of topsoil overlying at least 21 feet of stiff to very stiff sandy clay with minor layers of silty sand for the depth drilled, 21 feet. Free water was encountered in exploratory boring B-17 only at depth 20 feet at the time of drilling.

2. Considering the high swell potential of the sandy clays, weathered claystone, and claystone encountered in the exploratory borings and the nature of the proposed construction, we recommend that the residences be founded on straight-shaft drilled piers and have structural basement floors. Design parameters for the drilled piers are given in the body of the report and on the Lot Summary Sheets.

3. The pavement section for the internal streets should consist of 6 inches of granular base and 4 inches of asphalt.

4. Other geotechnical recommendations are provided in the body of the report.

PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical engineering study of forty-one lots and the internal streets in the Mesa Del Sol II Subdivision under construction on the north side of Jordan Drive just southeast of CY Avenue in Casper, Wyoming. This study was conducted for the purposes of evaluating the residential foundation conditions and the subgrade conditions for the internal streets, to provide a geotechnical engineering basis for the foundation design for the residences, and a pavement section for the internal streets. The study was conducted in general accordance with our proposal P15-83 to ECS Engineers dated June 2, 2015.

A field exploration program consisting of twenty-one exploratory borings was conducted to obtain information on subsurface conditions. Material samples obtained during the field exploration were tested in the laboratory to determine the classification and engineering characteristics of the foundation soils. The results of the field exploration and laboratory testing are presented herein.

This report has been prepared to summarize the data obtained during this study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design considerations for the foundation recommendations for the planned residences and a pavement thickness recommendation for the internal streets are included in the report. Summary sheets for the individual lots are included in Appendix A.

PROPOSED CONSTRUCTION

It is proposed to construct forty-one single-family residences for the Mesa Del Sol II Subdivision on Lots 9 through 34, 28A through 34A, and 42A through 47A. The residences will be one and two stories in height, wood frame construction with full basements. It is anticipated that the residential foundation loadings will be light as is typical with this type of construction. Sienna Drive, Casa Granda Drive, and portions of 30th Street and 31st Street will be graded and paved. If the design varies from the project description above, the recommendations presented in this report should be reevaluated.

SITE CONDITIONS

The Mesa Del Sol II Subdivision is being constructed immediately to the north of Jordan Drive and southeast of CY Avenue. At the time of the field investigation, the site had not been

graded and had a heavy grass cover. The high point of the site was near the intersection of Sienna Drive and 30th Street. From that point, the ground surface sloped down in all directions but most strongly to the south with a drop in elevation of approximately 10 feet.

FIELD EXPLORATION

The field exploration for the project was conducted on July 1 through 3, 2015. Twenty-one exploratory borings were drilled at the locations staked by the client explore the foundation soils and bedrock. The borings were advanced with 4-inch diameter continuous flight augers and logged by a project engineer.

Samples of the subsurface materials in the exploratory borings were taken with a 2-inch inside diameter spoon sampler. The sampler was driven into the various strata with blows from a 140-pound hammer falling 30 inches. This test is similar to the standard penetration test described by ASTM Method D-1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of the soils. Depths at which the samples were taken and the penetration resistance values of the drive samples are shown on the logs of exploratory borings, Figs. 2 and 3, with a legend and notes shown on Fig. 4.

Measurements for water level were made in the borings by lowering an M-Scope into the open hole shortly after completion of drilling. The borings were backfilled with auger cuttings to the ground surface after the water level readings were taken.

LABORATORY TESTING

Laboratory testing was conducted to study the engineering characteristics of the materials obtained from the exploratory borings. Samples obtained from the borings were examined and

visually classified in the laboratory by the senior project engineer. Laboratory testing was performed on selected samples to determine their classification, moisture content, dry density, volume change characteristics, pavement support characteristics, and water soluble sulfate content. Results of the laboratory testing are shown on Figs. 5 through 25 and summarized in Table I. A discussion of the laboratory testing procedures followed is presented below. The testing was conducted in general accordance with recognized test procedures, primarily those of the American Society for Testing and Materials (ASTM).

Index Properties: In order to identify soils and classify them into categories of similar engineering properties, the Unified Soil Classification System (ASTM D-2487) was used. This system is based on index property tests, including liquid limits and plastic limits (ASTM D-4318) and grain size distribution (ASTM D-422). Moisture contents were determined in accordance with ASTM D-2216. Moisture contents, dry densities, liquid and plastic limits, and the soil fractions are presented in Table I. Grain size distribution curves are shown on Figs. 5 through 12.

Swell-Consolidation: Swell-consolidation tests were conducted on samples of the foundation soils and bedrock to determine the swell-consolidation characteristics of those materials under loading when submerged in water. The samples were prepared and placed in an oedometer ring between porous discs. An initial seating load was placed on the samples. The samples were then submerged in water and the change in sample height was measured with a dial gauge. The samples were then loaded incrementally for 24-hour loading periods. The consolidation test procedures described are similar to ASTM D-2435. Results of the consolidation tests are plotted as a curve of the final strain at each increment of pressure against the log of the pressure. The swell-consolidation test results are shown on Figs. 13 through 21.

Proctor Compaction: The moisture-density relationships of a composite sample of the subgrade materials were conducted using the procedures of ASTM D-698, Method A. The sample was processed through the #4 screen before testing. The moisture-density relationships are shown on Fig. 22.

California Bearing Ratio: A sample of the potential pavement subgrade material was tested to determine its subgrade support properties for use in pavement design. The sample of the material was remolded to 95% of the standard Proctor (ASTM D-698) density near the optimum moisture content.

A California Bearing Ratio (CBR) test (ASTM D-1883) was performed on the remolded sample after being submerged in water for a period of 96 hours. The CBR test is a penetration test wherein a standard piston penetrates the soil at a rate of 0.05 inches per minute. The CBR value is the ratio of the test load to a standard unit load and is an indication of the strength of the soil. It is empirically related to the required thickness of pavement structure for a given traffic loading. Results of the CBR test are shown in Table I.

Water Soluble Sulfate Content: The percentage of water soluble sulfates was determined in general accordance with "Standard Methods for the Examination of Water and Wastewater, 15th ed.", for two samples of the foundation soils. The test results are shown in Table I.

SUBSURFACE CONDITIONS

The subsurface conditions across the forty-one lots were somewhat variable, as indicated by the exploratory borings B-1 through B-21. In borings B-1 through B-6, B-8 through B-16, and B-19 through B-21, the subsurface conditions consisted of zero to 12 inches of topsoil, zero to 13 feet of stiff to very stiff sandy clay, and zero to 9 feet of firm to medium hard weathered

claystone overlying hard to very hard claystone for the depth drilled, 21 feet. In borings B-7, B-17, and B-18, the subsurface conditions consisted of zero to 12 inches of topsoil overlying at least 21 feet of stiff to very stiff sandy clay with minor layers of silty sand for the depth drilled, 21 feet. Free water was encountered in exploratory boring B-17 only at depth 20 feet at the time of drilling.

Gradations of typical samples of the sandy clays are shown on Figs. 5, 7, 9, and 10. The sandy clays ranged from settling under load and when wetted under constant load to possessing a low to high swell potential with a percent swell ranging from 2.0% to 5.1% with an uplift pressure ranging from 2,600 psf to 14,000 psf when wetted under constant load as indicated by the swell-consolidation test results shown on Figs. 14, 17, 19, and 20.

Gradations of typical samples of the weathered claystone are shown on Figs. 5, 7, 8, 9, and 11. The weathered claystone possesses a moderate to high swell potential with a percent swell ranging from 3.8% to 14.2% and an uplift pressure ranging from 6,100 psf to 20,500 psf when wetted under constant load as indicated by the swell-consolidation test results shown on Figs. 13, 16, 17, 18, and 20.

Gradations of typical samples of the claystone are shown on Figs. 6, 11, and 12. The claystone possesses a low to high swell potential with a percent swell ranging from 1.4% to 6.1% and an uplift pressure ranging from 2,900 psf to 14,000 psf when wetted under constant load as indicated by the swell-consolidation test results shown on Figs. 14, 15, and 21.

A composite sample of the street subgrade soils, Composite A, was prepared from the auger cuttings from the upper 5 feet of the borings. The gradation, liquid limit, and plasticity index of Composite A are shown on Fig. 12. The moisture-density relationships of Composite A, determined in accordance with ASTM D-698, are shown on Fig. 22 and indicate a maximum

dry density of 116.1 pcf and an optimum moisture content of 13.0%. A remolded CBR value of 5.1% was determined for Composite A.

The laboratory test results are summarized in Table I.

FOUNDATION RECOMMENDATIONS

The design and construction criteria presented below should be observed for a straight-shaft pier foundation system. The construction details should be considered when preparing project documents.

(1) Piers should be designed for an allowable end bearing pressure of 10,000 psf to 20,000 psf and a skin friction of 1,000 psf to 2,000 psf for the portion of the pier below the bottom of grade beam or foundation wall. The allowable end bearing pressure and skin friction for the individual lots are given on the Lot Summary Sheets in Appendix A.

(2) Piers should also be designed for a minimum dead load pressure of 10,000 psf to 15,000 psf based on pier end area only. The required dead load pressure for the individual lots is given on the Lot Summary Sheets in Appendix A. Application of dead load pressure is an important and effective way in mitigating foundation movement due to swelling soils. However, if the minimum dead load requirement cannot be achieved and the piers are spaced as far apart as practical, the pier length should be extended beyond the minimum penetration to make up the dead load deficit. This can be accomplished by assuming one-half of the skin friction acts in the direction to resist uplift.

(3) A minimum pier length of 15 feet is recommended.

(4) Piers should be designed to resist lateral loads using a modulus of horizontal subgrade reaction of 300 tcf. The modulus value given is for a long one-foot wide pier and must be

corrected for pier size.

(5) Piers should be reinforced their full length with at least one No. 5 reinforcing rod to resist tension created by the swelling materials.

(6) A 4 inch void should be provided beneath the grade beams to concentrate pier loadings and to prevent the expansive materials from exerting uplift forces on the grade beams.

(7) A minimum pier diameter of 10 inches is recommended to facilitate proper cleaning and observation of the pier hole.

(8) Concrete used in the piers should be a fluid mix with sufficient slump so it will fill the void between reinforcing steel and the pier hole.

(9) Based on the results of our field exploration, laboratory testing, and our experience with similar, properly constructed drilled pier foundations, we estimate pier settlement will be low. Generally, we estimate the settlement of a pier up to 2 feet in diameter will be approximately 1 inch when designed according to the criteria presented herein.

(10) Pier holes should be properly cleaned prior to the placement of concrete.

(11) The absence of water in all but one of the exploratory borings indicates the use of casing or dewatering equipment in the pier holes will probably not be required to reduce water infiltration. However, if water infiltration does occur, the requirements for casing can sometimes be reduced by placing concrete immediately upon cleaning and observing the pier hole. In no case should concrete be placed in more than 3 inches of water unless the Tremie method is used.

(12) The drilled shaft contractor should mobilize equipment of sufficient size and operating condition to achieve the required bedrock penetration.

(13) Care should be taken that the pier shafts are not oversized at the top. Mushroomed pier tops can reduce the effective dead load pressure on the piers.

(14) Concrete should be placed in piers the same day they are drilled. The presence of water or caving soils may require that concrete be placed immediately after the pier hole is completed. Failure to place concrete the day of drilling will normally result in a requirement for additional bedrock penetration.

(15) A representative of the soil engineer should observe pier drilling operations on a full-time basis.

FOUNDATION WALLS

Foundation walls which are laterally supported and can be expected to undergo only a moderate amount of deflection should be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of 50 pcf for backfill consisting of the on-site soils.

The pressure recommended above assumes drained conditions behind the walls and a horizontal backfill surface. The buildup of water behind a wall or an upward sloping backfill surface will increase the lateral pressure imposed on a foundation wall.

Care should be taken not to over-compact the backfill since this could cause excessive lateral pressure on the walls.

FLOOR SLABS

Floor slabs present a very difficult problem where highly expansive materials are present near floor slab elevation because sufficient dead load cannot be imposed on them to resist the uplift pressure generated when the materials are wetted and expand. Based on the moisture-

volume change characteristics of the materials encountered, we believe the only way to prevent damage as a result of floor slab movement will be to construct a structural floor above a well-ventilated crawlspace. The floor should be supported on grade beams and piers the same as the main structure.

WATER SOLUBLE SULFATES

The concentration of water-soluble sulfates measured in two samples of the foundation materials obtained from the exploratory borings ranged from 0.34% to 0.39% for the foundation material. This range of concentration of water-soluble sulfates represents a severe degree of sulfate attack on concrete exposed to these materials. The degree of attack is based on a range of negligible, positive, severe, and very severe, as presented in the U.S. Bureau of Reclamation Concrete Manual.

Based on this information, we recommend all concrete exposed to the on-site materials contain a sulfate resistant cement with less than 5% tri-calcium aluminate (Type II modified or Type V). Concrete should be a relatively rich mix and air entrained.

UNDERDRAIN SYSTEM

Underdrain systems are recommended for those lots where basements are constructed because it is anticipated that water will be trapped against the basement foundation walls. Our experience indicates local perched water conditions can develop on top of the clays and weathered bedrock after construction.

Free-draining granular material used in the drain system should contain less than 5% passing the No. 200 sieve, less than 10% passing the No. 4 sieve and have a maximum size of 2 inches.

The drains should consist of drain pipe placed in the bottom of a trench and surrounded above the invert level with free-draining granular material. The free-draining backfill should extend 1 foot above the floor level. The perimeter drains should be at least 4 inches in diameter. The drain lines should be placed at least 2 feet below the floor level and graded to sumps at a minimum slope of ½% where water can be removed by pumping or gravity drainage.

SURFACE DRAINAGE

The following drainage precautions should be observed during construction and maintained at all times after the homes have been completed.

(1) Excessive wetting or drying of the foundation excavations and underslab areas should be avoided during construction.

(2) Exterior backfill should be adjusted to near optimum moisture and compacted to at least 85% of the maximum standard Proctor (ASTM D-698) density.

(3) The ground surface surrounding the exterior of the homes should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 6 inches in the first 10 feet in unpaved areas and a minimum slope of 3 inches in the first 10 feet in paved areas.

(4) Roof downspouts and drains should discharge well beyond the limits of all backfill.

(5) Landscaping which requires typical irrigation and lawn sprinkler heads should be located at least 10 feet from foundation walls.

(6) Plastic membranes should not be used to cover the ground surface adjacent to foundation walls.

PAVEMENT SECTION

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings. Soils are represented for pavement design purposes by means of a soil support value for flexible pavements and a modulus of subgrade reaction for rigid pavements. Both values are empirically related to strength. Pavement design procedures are based on strength properties of the subgrade and pavement materials assuming stable, uniform conditions.

Subgrade Materials: Based on the results of the field and laboratory studies, the subgrade materials at the site classify as A-6 with a group index of 12.8 in accordance with the American Association of State Highway and Transportation Officials (AASHTO) classification. A California bearing ratio value of 5.1 was determined for the subgrade material.

Pavement Design: The pavement thickness was prepared for traffic loading of E_{18}SAL of 65,600. The pavement structure for internal streets should consist of 6 inches of granular base course and 4 inches of asphalt.

Subgrade Preparation: Prior to placing the pavement section, the entire subgrade area should be scarified to a depth of 12 inches, adjusted to a moisture content near optimum, and compacted to 95% of the maximum standard Proctor density. The pavement subgrade should be proofrolled with a heavily loaded pneumatic-tired vehicle. Pavement design procedures assume a stable subgrade. Areas which deform excessively under heavy wheel loads are not stable and should be removed and replaced to achieve a stable subgrade prior to paving.

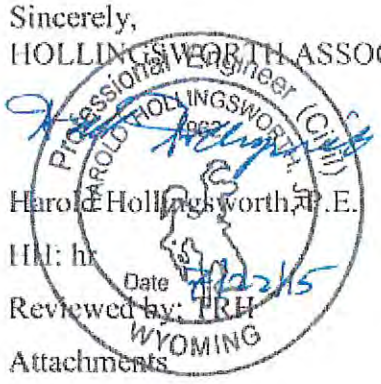
Drainage: The collection and diversion of surface drainage away from paved areas is extremely

important to the satisfactory performance of pavement. Drainage design should provide for the removal of water from paved areas and prevent the wetting of the subgrade soils.

LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area for use by the client for design purposes. The nature and extent of subsurface variations across the site may not become evident until construction is performed. If during construction, fill, soil, rock or water conditions appear to be different from those described herein, this office should be advised at once.

Sincerely,
HOLLINGSWORTH ASSOCIATES, INC.



Harold Hollingsworth, P.E.
HH: hr
Reviewed by: TRH
Attachments

EXHIBIT "C" - SIXTEEN (16) PAGES
Survey Results

As a result of recent news articles about sinking houses on the west side of Casper, and the implication that it was caused by inadequate engineering/soil compaction, the City Council is considering an ordinance to require engineered compaction testing during the construction and backfill of all new one and two-family dwellings.

The City Council is holding a work session on September 25, 2018 to discuss whether or not to move forward on this issue. We are asking for feedback from the development community prior to the work session so that your comments and concerns will be considered as a part of the Council's decision-making process. If you'd like to provide your input/comments, please fill out the form below, and submit it to Dan Elston, Building Official, as soon as possible. You are encouraged to Email your comments to delston@casperwy.gov, or you may drop them off in person at the Building Department office.

1. Name and Company: Coldwell Banker The Legacy Group

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes ✓ No _____ Maybe _____

3. How would requiring compaction testing impact your business (be specific)?
We live in a very litigous world and it would be beneficial to real estate professionals, builders buyers & sellers.

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
500 - 1,000 ?

5. How many residential one/two-family dwellings do you build per year on average? 2-3

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? _____ How many have resulted in litigation? Ø

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
Yes! Absolutely.

8. Please provide any additional comments:
I think this is a huge concern in the real estate industry & hope we are proactive about this to avoid future issues with Builders, Buyers, Sellers & real estate professionals!
Thank you!

(1)

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1. Name and Company: Bob King

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes ✓ No_____ Maybe_____

3. How would requiring compaction testing impact your business (be specific)?

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?

5. How many residential one/two-family dwellings do you build per year on average? _____

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? _____ How many have resulted in litigation?_____

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?

8. Please provide any additional comments:

I am not a contractor or developer, and therefore do not feel qualified to answer many of these questions. However, from a consumer's standpoint, it seems a good idea.

Bob King

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1. Name and Company: Rusty Parker All Property Broker

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes X No_____ Maybe_____

3. How would requiring compaction testing impact your business (be specific)?

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
Yes Unknown

5. How many residential one/two-family dwellings do you build per year on average? —

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year?_____ How many have resulted in litigation? —

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?

8. Please provide any additional comments:
Anything to help consumers that the contractors do not add 20-30% price increase to the Consumer.

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1. Name and Company: Jens Basil Decade, inc.

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No_____ Maybe__X__

3. How would requiring compaction testing impact your business (be specific)?
Testing backfill would be too costly due to multiple return trips for engineers and idling excavation equipment. Sub-grade and structural fill should be tested under footers.

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
We already test sub grade and base. So none unless backfill tests are also required

5. How many residential one/two-family dwellings do you build per year on average? _____

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? _____ How many have resulted in litigation?_____

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?

_____

_____

8. Please provide any additional comments:

My understanding of the Mesa subdivision issue is that the builder used spread footings after engineers recommended caissons. Compaction testing wont help if you use the wrong foundation.

As a result of recent news articles about sinking houses on the west side of Casper, and the implication that it was caused by inadequate engineering/soil compaction, the City Council is considering an ordinance to require engineered compaction testing during the construction and backfill of all new one and two-family dwellings.

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1. Name and Company: Brian Chandler, ECS Engineers

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No_____ Maybe X

3. How would requiring compaction testing impact your business (be specific)?
None

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?

5. How many residential one/two-family dwellings do you build per year on average? _____

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? _____ How many have resulted in litigation?_____

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?

8. Please provide any additional comments: I have been performing geotechnical engineering in Casper and throughout Wyoming for almost 30 years.

(5)

As a result of recent news articles about sinking houses on the west side of Casper, and the implication that it was caused by inadequate engineering/soil compaction, the City Council is considering an ordinance to require engineered compaction testing during the construction and backfill of all new one and two-family dwellings.

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1. Name and Company: Applied Construction Tech

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe_____

3. How would requiring compaction testing impact your business (be specific)?
It would slow production down and increase costs for Builders. Therefore Basic, market and people would not be able to afford new houses.

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
Yes Approx $6,000 to $12,000

5. How many residential one/two-family dwellings do you build per year on average? 25

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 1 How many have resulted in litigation? 0

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
Yes

8. Please provide any additional comments:

Document.pdf

As a result of recent news articles about sinking houses on the west side of Casper, and the implication that it was caused by inadequate engineering/soil compaction, the City Council is considering an ordinance to require engineered compaction testing during the construction and backfill of all new one and two-family dwellings.

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1. Name and Company: Zac Horner Z3C Construction Inc
2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe_____
3. How would requiring compaction testing impact your business (be specific)?
   This would become a major road block in scheduling inspections and in the cost to have major equipment waiting for inspection
4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
   Yes $5,000 - 10,000
5. How many residential one/two-family dwellings do you build per year on average? 2
6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 0 How many have resulted in litigation? 0
7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
   NO
8. Please provide any additional comments:

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1. Name and Company: Mountain View Builders

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe_____

3. How would requiring compaction testing impact your business (be specific)?
Added Cost. Does not & will not ensure that a foundation will not fail such as what has happened in Mesa Del Sol. Properly engineered foundations & executed ensure the stability of the foundation, not compaction testing.

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
Yes! Aside from the engineers doing the testing @ 4-5K Additional Bracing & Labor costs could exceed to 10-15K. Simply not economical or needed.

5. How many residential one/two-family dwellings do you build per year on average? 3-4

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 0 How many have resulted in litigation? 0

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
Absolutely not. Again almost every slab of concrete whether sidewalks, driveways, porches ETC are going to crack no matter what measures are taken prior to installing.

8. Please provide any additional comments:
I am against any proposed ordinance to compaction testing due to the inherent cost that the market cannot bare & due to the fact that compaction testing will not keep a poorly constructed foundation from failing.

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1. Name and Company: Erik Hunn P&Z

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No ✓ Maybe_____

3. How would requiring compaction testing impact your business (be specific)?

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
Yes

5. How many residential one/two-family dwellings do you build per year on average? N/A

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? _____ How many have resulted in litigation?_____

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
No - Sidewalks is a code enforcement issue. And if these issues are addressed will help mitigate these issues going forward. Trees & Road maintenance can also impact these slabs

8. Please provide any additional comments:
Knee-jerk reaction to quest towards building

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1. Name and Company: Lisa Burridge - Assoc. Real Estate (Lisa Burridge)

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe X
only once it is fully determined that this is a major issue all over Town

3. How would requiring compaction testing impact your business (be specific)?
It ~~it~~ won't matter unless the compaction is "certified" & "guaranteed" and the certifying company has liability for results.
2. If #1, the cost of affordable Homes will increase and market is already difficult.

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
yes. No idea but the excavation would change more, the engineer certifying would charge + City would need to oversee

5. How many residential one/two-family dwellings ~~do you~~ are you involved build per year on average? 80

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? ~~0~~ How many have resulted in litigation? ~~0~~
In 20 yrs - 0 litigation due to this.

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
NO. But maybe you should require rebar in all driveways, etc.

8. Please provide any additional comments:
- I would caution adding additional costs when the vast majority of builds do not have issues.
- Engineers who provide soils tests are unwilling to guarantee or be financially responsible.
- These new requirements won't solve anything unless there is some way to hold

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1. Name and Company: Eades Construction

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe_____

3. How would requiring compaction testing impact your business (be specific)?
It would cost more in dirtwork for compaction tests, it would delay project waiting for Engineers to show up & Get Results Back

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
yes - 1500 to 2500 more just in testing

5. How many residential one/two-family dwellings do you build per year on average? 2 to 4

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 0 How many have resulted in litigation? 0

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
NO

8. Please provide any additional comments:
I provided Dan Elston with a full letter over a month ago. It has more information for reasons not Requiring compaction testing.

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1. Name and Company: Boyle Excavation - Stephen Boyle (247-2251)
2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe_____
3. How would requiring compaction testing impact your business (be specific)?
   Time, waiting for tests cost will be passed on to home owner @ a cost of 1,000.00 to $3,000
4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
5. How many residential one/two-family dwellings do you build per year on average? 10
6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 0 How many have resulted in litigation? 0
7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
   No
8. Please provide any additional comments:
   my company + Contracts Comp when backfilling Holes. We Rely on our engineers Report on over dep + Compens. and spend money there instead of disregarding Reports like what happened behind Grainer Ford when Realtors Run the housing Projects, They cut Corners To Save a Buck

(12)

and it cost them in the end. the Rest of us who do the job Right don't deserve to pay for there mistake for Cutting Corners. Good Contractors do it Right. I work for (Good) Contractors, (Eades const,) (Coppedge const) (Capshaw) (Tillip const) we dont Cut Corners!!

rcb

As a result of recent news articles about sinking houses on the west side of Casper, and the implication that it was caused by inadequate engineering/soil compaction, the City Council is considering an ordinance to require engineered compaction testing during the construction and backfill of all new one and two-family dwellings.

The City Council is holding a work session on September 25, 2018 to discuss whether or not to move forward on this issue. We are asking for feedback from the development community prior to the work session so that your comments and concerns will be considered as a part of the Council's decision-making process. If you'd like to provide your input/comments, please fill out the form below, and submit it to Dan Elston, Building Official, as soon as possible. You are encouraged to Email your comments to delston@casperwy.gov, or you may drop them off in person at the Building Department office.

---

1. Name and Company: Anna Zoric

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No ✓ Maybe_____

3. How would requiring compaction testing impact your business (be specific)? (compaction testing)
Increases cost - we do it! but it is not a cost we are necessarily able to pass on to consumer

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
yes

5. How many residential one/two-family dwellings do you build per year on average? _____

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 1 in 15 years How many have resulted in litigation? 0

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
no, concrete moves & heaves & cracks. Many homeowners elect to do their own improvement projects. They should not be required to go through a permitting process for a weekend project or repair.

8. Please provide any additional comments:
→ Regulators have a tendency to have a knee-jerk reaction to a one time or occassional negative incident by slapping a regulation on the broad group. If the group is having a high percentage (say 90% +) positive result, why penalize the broad group? In an area of marginal soils, as demonstrated by the soils ⇒

-test done during development or recognized problem areas, a responsible builder is going to ~~not~~ have foundations designed appropriate to the site

Note: the builders who are still here (the boom-followers) have moved on) have to protect their reputation as a quality builder to learn ~~button~~ business during lean markets

Note: compaction testing will not add any value to the home's market value or marketability

As a result of recent news articles about sinking houses on the west side of Casper, and the implication that it was caused by inadequate engineering/soil compaction, the City Council is considering an ordinance to require engineered compaction testing during the construction and backfill of all new one and two-family dwellings.

The City Council is holding a work session on September 25, 2018 to discuss whether or not to move forward on this issue. We are asking for feedback from the development community prior to the work session so that your comments and concerns will be considered as a part of the Council's decision-making process. If you'd like to provide your input/comments, please fill out the form below, and submit it to Dan Elston, Building Official, as soon as possible. You are encouraged to Email your comments to delston@casperwy.gov, or you may drop them off in person at the Building Department office.

1. Name and Company: Current Homes LLC

2. Are you in favor of requiring soil compaction testing during construction of one and two family residential dwellings? Yes_____ No X Maybe_____

3. How would requiring compaction testing impact your business (be specific)?
   More cost for Houses

4. Would compaction testing affect the final cost of a home? If so, by how much (estimated)?
   yes - whatever it costs + Time + hassel

5. How many residential one/two-family dwellings do you build per year on average? 3

6. Number of complaints that you have received due to compaction/settling of one/two-family dwellings per year? 0 How many have resulted in litigation? 0

7. Some members of the City Council are also concerned about cracking sidewalks, driveways, steps, etc; however, building permits are not currently required for those types of construction/installations. Do you feel that concrete work should require a permit, and compaction testing should also be required?
   NO

8. Please provide any additional comments:
   Try a form that goes with Building Permits, that requires Builder or Excavator to sign - saying they have compacted. Then if there are complaints you can add fines to the litigation for not doing what you signed off. Most do it right, don't penilize them for the small percent that are not good builders!

EXHIBIT "D1" - ONE (1) PAGE
Summary of Letters

SUMMARY OF LETTERS			
NAMES	**OCCUPATION**	**IN FAVOR OF TESTING FOUNDATION BACKFILL**	**SUGGESTIONS**
R. Eades	Builder	No (See Letter Ex. A)	
J. Harmsen/Copperleaf	Builder	No – very rare-problem associated with fill density (See Ex. A)	Developers need geotechnical engineer on site daily before developer starts moving any earth – geotechnical report submitted to City before subdivision accepted
J. Alt/Tri-Mountain Homes	Builder	No, but geotechnical testing w/lot specific report should be required submission w/home permit request (See Ex. A)	See – Geotechnical testing comment – Ex. A
T. Schank	Architect	No, but initial testing before foundation and floor slab pour (See Ex. A)	The final grade of the home's foundation and floor slab should be properly completed and tested by engineer
Unsigned	Maybe Engineer	No, request is too broad. Testing should be dependent on lot specific soil conditions (See Ex. A)	Geotechnical study a must. Native soils are generally already stable, but if there is over-burden, or over-excavating w/structural fill needed, compaction test of fill; this is a requirement of geotechnical report, not City, but give City Inspectors authority to monitor and mandate compliance
C. Shopp	Realtor	No, cost increase would foreclose many from new home purchase – cost maybe as much as $10,000 (See Ex. A)	Use good builders

EXHIBIT "D2" - ONE (1) PAGE
Summary of Survey Results

SUMMARY OF SURVEY RESULTS			
NAMES	**OCCUPATION**	**IN FAVOR OF SOIL COMPACTION TESTING**	**IN FAVOR OF FLAT WORK PERMIT TESTING**
Coldwell Banker - Legacy	Realtor-Developer	Yes	Yes
Bob King	Consumer	Yes	
Rudy Andrew All Property	Realtor	Yes	
Jens Boril, Decade, Inc.		Subgrade and structure fill should be tested under footers	
B. Chandler	Engineer	Maybe	
Applied Construction	Builder	No	Yes
Zac Horner Z & C Construction	Builder	No	No
Mountain View Builders	Builder	No	No
Erik Dune	P&Z	No	No
Lisa Burridge	Realtor-Developer	No/Maybe	No, but include rebar
Eades Construction	Builder	No	No
Boyle Excavation	Excavation	No	No
Ronna Boril	Realtor-Developer	No	No
Current Homes	Builder	No	No

EXHIBIT "E"

ORDINANCE NO. ___

AN ORDINANCE AMENDING CHAPTER 15.02.130 OF THE CASPER MUNICIPAL CODE

WHEREAS, the current Casper Municipal Code regarding “Testing" deleted all requirements cited in the International Residential Code;

WHEREAS, there is a need for soils testing and foundation soils observations to permit soil residential construction
foundations to protect consumers of residential construction; and,

WHEREAS, there is a need for additional protections to be implemented concurrent with and consistent with the soils testing and observations required herein.

NOW, THEREFORE, be ordained by the governing body of the City of Casper, Wyoming: that Section 15.02.130 of the Casper Municipal Code be amended to read:

§ 15.02.130-Testing.

Section N1102.4.1.2, - Testing - as referenced in the International Residential Code is deleted in its entirety.

The testing required pursuant to this code provision is for soils testing, to protect consumers of residential construction including for one- or two-family unit homes in the City of Casper, Wyoming. The requirements herein are minimum standards. Developers, contractors and engineers should fulfill their obligation to their clients and the public consistent with civil, criminal and administrative laws as applicable to the subdivisions’ locations and circumstances.

A. Requirement for Geotechnical Soils Test and Monitoring

(i) For all subdivisions that are constructed on natural soils, a geotechnical report shall be required for the subdivision. If the geotechnical report finds soils, compaction, water moisture or other indication which results in the suggestion of pier construction then lot specific requirements referenced in sub paragraph (ii) below shall be required. If there are no findings which result in the suggestion of pier construction, then the geotechnical report shall be provided to the City, and to prospective builders and to consumers upon request. No building permits may be issued until the City has received the geotechnical report.

(ii) For all subdivisions for which the geotechnical report in sub paragraph (a) above suggests pier construction, and/or for subdivisions that are constructed, in part or whole, on over burden, fill or non-natural materials a geotechnical report shall be

required for the subdivisions and each lot within the subdivision. This testing and reports, therefore, must be complete and provided to the City before any building permit may be issued for any residential construction within the subdivision.

(iii) All soils tests required by this code provision shall be done and certified by a licensed Wyoming registered Professional Engineer (PE) using an approved method. Additionally, minimum soils observations and monitoring of soil and foundations shall include those inspections and observations referred in 15.02.130 B-below.

(iv) Geotechnical reports obtained pursuant to this code section shall include at a minimum, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered.
5. Recommendations for foundation type and design criteria, including, but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.
6. Expected total and differential settlement.
7. Deep foundation information in accordance with Section 1803.5.5 of the International Building Code.
8. Special design and construction provisions for foundations of structures founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.8 of the International Building Code.
10. Controlled low-strength material properties and testing in accordance with Section 1803.5.9 of the International Building Code.

B. <u>Requirements for Foundations</u>

(i) Requirements for foundation construction shall be capable of accommodating all loads and of transmitting the resulting loads to the supporting soil, in conformance with Section R301 and Chapter 4 of the International Residential Code. Fill soils that support footings, foundations and piers shall be designed, installed, and tested in accordance with accepted engineering practice and as required by principles established herein.

(ii) In the process of foundation preparation, there shall be an open hole/open excavation inspection conducted by the builder's engineer prior to the placement of any footing or foundation. Such inspection shall be documented by the builder and by the engineer and provided by both to the City's Building Inspection Office.

(iii) In the process of backfilling foundations, support footings, or slabs, there shall be inspection and approval of the bottom of the excavation prior to placing fill, with the same documentation and reporting requirements as stated in 15.02.13B(ii) above.

(iv) If there are sub drainpipes, there shall be an inspection and approval of the sub drainpipes prior to placing gravel, again the inspection must be documents and provided to the City as stated above.

C. Soil Compaction Testing – Foundations

(i) If soils compaction testing is recommended by the builder's Professional Engineer, there shall be field tests taken at a minimum of 12" or for every 500 $yd.^3$ of fill placed, whichever is more restrictive. Test results showing less than required relative compaction are not acceptable. Description of removal and re-compaction of the unacceptable fill and its retesting shall be included in the Wyoming Professional Engineer's report.

(ii) There shall be a description made by the soils engineer of the following:

a) Materials encountered at the bottom of the excavation; and
b) Preparation of the bottom prior to placement of fill; and where there is over-surface fill a non-natural material:.
c) Fill placement, and preparation.
d) Moisture content control method and results.
e) Thickness of the fill layers prior to compaction.
f) Types of compaction equipment and method of mechanical compaction.
g) Identify fill materials used with United Soil Classification, maximum dry density and optimum moisture content.

(iii) Nuclear testing results. If used, it shall be performed in conformance with I.B. P/BC2001-28: At least one sand cone test (A.S.T.M. 1556) shall be taken for each five nuclear tests (A.S.T.M. 2922 and 3017). The sand cone tests shall be taken at the general location and elevation as one of the five nuclear tests to verify accuracy of the nuclear test results.

(iv) Laboratory Testing

Results of all laboratory tests with applicable ASTM or UBC standard designation numbers and graphical presentation of maximum dry density and optimum moisture content testing. All soil testing shall be performed by a laboratory.

D. Final Foundation Soils Documentation

At the point of the framing inspection, the builder shall submit "final As-built" documentation, stamped by Engineer, which will be kept on file at the City, certifying compliance with the requirements of this Chapter and professional good standards to each lot's foundation.

E. Violations

Violations of this Code provision may lead to civil liability of the offending party and appropriate code enforcement measures, including revoking and/or holding in abeyance, issued building permits and/or a denial of a Certificate of Occupancy.

This Ordinance shall become effective on _____, 2018.

PASSED on 1st reading the ____ day of _____, 2018.

PASSED on 2nd reading the ____ day of _____, 2018.

PASSED, APPROVED AND ADOPTED on 3rd and final reading the ____ day of _____, 2018.

APPROVED AS TO FORM:

_____

CITY OF CASPER, WYOMING

ATTEST:

A Municipal Corporation

_____

Fleur D. Tremel
City Clerk

_____

Ray Pacheco
Mayor

One Cent #16 Community Projects Summary

	Organization	Description	Amount Requested	Notes	Previous Funding	Able to be Legally Funded	Statutory Reasoning	Staff Recommendation	Shawn Johnson	Charlie Powell	Chris Walsh	Bob Hopkins	Jesse Morgan	Ray Pacheco	Mike Huber	Dallas Laird	Kenyne Humphrey	AVERAGE
1	**Self Help Center**	Salaries and Capital	$302,000.00	Funded through CAP previously.	Yes	Yes	WY Constitution 16-6	$300,000.00	$300,000.00	$150,000.00	$170,000.00	$140,000.00	$162,000.00	$300,000.00	$150,000.00	$302,000.00	$300,000.00	**$219,333.33**
2	**Casper Mountain Ski Patrol**	Equipment	$3,000.00		Yes	Through Contract	Contract for Professional Services	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	abstain	$3,000.00	$3,000.00	**$3,000.00**
3	**UW Extension of Natrona County**	Salaries	$103,560.00		Yes	Through Contract	Contract for Professional Services	$100,000.00	$0.00	$80,000.00	$0.00	$80,000.00	$103,560.00	$100,000.00	$104,000.00	$103,560.00	$0.00	**$63,457.78**
4	**Natrona County Public Library**	Materials and Vehicle	$962,500.00	Funds from last cycle went to We Read Program. County Agency	Yes	Yes	WY Constitution 16-6	$0.00	$0.00	$200,000.00	$562,000.00	$800,000.00	$320,833.33	$0.00	$162,000.00	$962,500.00	$0.00	**$334,148.15**
5	**CASA (Court Appointed Special Advocates)**	Salaries	$20,000.00	Funded through CAP previously.	Yes	Yes	WY Constitution 16-6	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$0.00	$0.00	$20,000.00	$0.00	$20,000.00	$15,000.00	**$12,777.78**
6	**Mercer Family Resource Center**	Salaries and Programs	$190,000.00	Funded through CAP and General Fund previously.	Yes	Yes	WY Constitution 16-6	$190,000.00	$190,000.00	$100,000.00	$39,000.00	$130,000.00	$38,200.00	$190,000.00	$190,000.00	$190,000.00	$125,000.00	**$132,466.67**
7	**Children's Advocacy Project**	Salaries, Programs, and Supplies	$160,000.00	Funded through CAP and General Fund previously.	Yes	Yes	WY Constitution 16-6	$150,000.00	$160,000.00	$80,000.00	$160,000.00	$55,000.00	$160,000.00	$150,000.00	$160,000.00	$160,000.00	$160,000.00	**$138,333.33**
8	**Joshua's Storehouse**	Supplies and Food	$26,000.00	Director had medical reason for missing presentation.	Yes	Yes	WY Constitution 16-6	$25,000.00	$26,000.00	$20,000.00	$0.00	$0.00	$0.00	$25,000.00	$0.00	$26,000.00	$0.00	**$10,777.78**
9	**Casper Sports Alliance**	Venue and Programming Fees	$87,250.00		Yes	Yes	Wyo. Stat. 15-1-111	$0.00	$0.00	$30,000.00	$45,500.00	$0.00	$87,250.00	$0.00	$0.00	$87,250.00	$87,000.00	**$37,444.44**
10	**Youth Crisis Center**	Salaries, Equipment, and Supplies	$329,964.00		Yes	Yes	WY Constitution 16-6	$330,000.00	$300,000.00	$200,000.00	$330,000.00	$300,000.00	$134,200.00	$330,000.00	$200,000.00	$329,964.00	$329,000.00	**$272,573.78**
11	**National Historic Trails Center**	Equipment	$85,000.00	A federal government building. May be able to receive funds from Feds.	Yes	Yes	Wyo. Stat. 15-1-111	$0.00	$0.00	$30,000.00	$0.00	$0.00	$85,000.00	$0.00	$0.00	$85,000.00	$0.00	**$22,222.22**
12	**Cadoma Foundation**	Land Purchase and Development	$450,000.00	Have not raised any other funds for project completion.	No	No		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$450,000.00	$0.00	**$50,000.00**
13	**Greater Wyoming Big Brothers Big Sisters**	Salaries, Programs, and Facilities	$270,199.00		Yes	Yes	WY Constitution 16-6	$270,000.00	$200,000.00	$50,000.00	$270,199.00	$41,000.00	$0.00	$270,000.00	$0.00	$270,199.00	$270,000.00	**$152,377.56**
14	**Child Development Center**	Salaries, Facilities, and Materials	$100,000.00		Yes	Yes	WY Constitution 16-6	$100,000.00	$100,000.00	$80,000.00	$100,000.00	$100,000.00	$40,000.00	$100,000.00	$80,000.00	$100,000.00	$80,000.00	**$86,666.67**
15	**Iris House**	Salaries	$100,000.00	New request	No	Yes	WY Constitution 16-6	$0.00	$0.00	$20,000.00	$100,000.00	$0.00	$0.00	$0.00	$0.00	$100,000.00	$0.00	**$24,444.44**
16	**Interfaith of Natrona County**	Salaries, Facilities, and Services	$240,000.00	Funded through CAP previously.	Yes	Yes	WY Constitution 16-6	$240,000.00	$240,000.00	$120,000.00	$100,000.00	$100,000.00	$0.00	$240,000.00	$0.00	$240,000.00	$240,000.00	**$142,222.22**
17	**Casper Family Connections**	Salaries	$203,160.00	New request	No	Yes	WY Constitution 16-6	$0.00	$0.00	$40,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$203,160.00	$100,000.00	**$38,128.89**
18	**YMCA of Natrona County**	Aquatics Center	$1,500,000.00	It would compete with a City resource, the Casper Family Aquatic Center.	Yes	?	Policy call if it advertizes City Resources.	$0.00	$0.00	$0.00	$0.00	$1,500,000.00	$0.00	$0.00	$0.00	$1,500,000.00	$0.00	**$333,333.33**
19	**Natrona County Meals On Wheels**	Cargo Van	$39,500.00		Yes	Yes	WY Constitution 16-6	$35,000.00	$39,500.00	$39,500.00	$40,000.00	$0.00	$39,500.00	$35,000.00	$40,000.00	$39,500.00	$39,500.00	**$34,722.22**
20	**The Lyric**	HVAC, Contract for Deed	$715,000.00	Typically the City will not buy a building for another entity. New request		Yes	Wyo. Stat. 15-1-111	$0.00	$0.00	$300,000.00	$0.00	$715,000.00	$0.00	$100,000.00	$400,000.00	$715,000.00	$715,000.00	**$327,222.22**

One Cent #16 Community Projects Summary

	Organization	Description	Amount Requested	Notes	Previous Funding	Able to be Legally Funded	Statutory Reasoning	Staff Recommendation	Shawn Johnson	Charlie Powell	Chris Walsh	Bob Hopkins	Jesse Morgan	Ray Pacheco	Mike Huber	Dallas Laird	Kenyne Humphrey	AVERAGE
21	**Community Action**	Housing Support and Program Support	$120,000.00	Funding for their programs, not for redistribution	Yes	Yes	WY Constitution 16-6	$100,000.00	$120,000.00	$0.00	$100,000.00	$100,000.00	$0.00	$100,000.00	$100,000.00	$120,000.00	$0.00	**$71,111.11**
22	**Seton House**	Facility and Maintenance	$156,500.00	Funded through CAP previously.	Yes	Yes	WY Constitution 16-6	$155,000.00	$156,500.00	$120,000.00	$156,500.00	$155,000.00	$156,500.00	$155,000.00	$150,000.00	$156,500.00	$156,000.00	**$151,333.33**
23	**Poverty Resistance Food Pantry**	Salaries, Equipment, and Food	$112,600.00		Yes	Yes	WY Constitution 16-6	$75,000.00	$112,600.00	$80,000.00	$0.00	$0.00	$0.00	$75,000.00	$0.00	$112,600.00	$0.00	**$42,244.44**
24	**Wyoming Food for Thought Project**	Salaries, Facilities, and Supplies	$165,000.00		Yes	Yes	WY Constitution 16-6	$100,000.00	$165,000.00	$50,000.00	$0.00	$0.00	$165,000.00	$0.00	$0.00	$165,000.00	$160,000.00	**$78,333.33**
25	**Wyoming Food Bank of the Rockies**	Food Delivery and Fuel	$20,000.00		Yes	Yes	WY Constitution 16-6	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$15,000.00	$20,000.00	$20,000.00	$20,000.00	**$19,444.44**
26	**United Way**	Salary	$38,680.00		Yes	Yes	WY Constitution 16-6	$0.00	$38,680.00	$10,000.00	$39,000.00	$0.00	$0.00	$0.00	$10,000.00	$38,680.00	$0.00	**$15,151.11**
27	**Boys & Girls Club**	Facilities	$445,836.05		Yes	Yes	WY Constitution 16-6	$350,000.00	$300,000.00	$200,000.00	$223,000.00	$0.00	$445,836.05	$205,000.00	$0.00	$445,836.05	$250,000.00	**$229,963.57**
28	**Downtown Development Authority**	Equipment	$23,850.00		Yes	Yes	Wyo. Stat. 15-1-111	$20,000.00	$0.00	$15,000.00	$24,000.00	$0.00	$23,850.00	$20,000.00	$0.00	$23,850.00	$23,850.00	**$14,505.56**
29	**Central Wyoming Hospice and Transitions**	Operations and Equipment	$180,000.00	Funded through CAP previously.	Yes	Yes	WY Constitution 16-6	$147,000.00	$100,000.00	$0.00	$180,000.00	$147,000.00	$180,000.00	$147,000.00	$100,000.00	$180,000.00	$180,000.00	**$134,888.89**
30	**Casper Mountain Biathlon**	Salaries, Equipment, and Facilities	$420,000.00	Not within City limits to advertize resources of the City.	Yes	No		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$420,000.00	$0.00	**$46,666.67**
31	**Science Zone**	Operations and Facilities	$1,080,000.00		Yes	Yes	Wyo. Stat. 15-1-111	$0.00	$0.00	$200,000.00	$0.00	$1,000,000.00	$0.00	$150,000.00	$0.00	$1,080,000.00	$1,080,000.00	**$390,000.00**
32	**Casper Community Greenhouse**	Salaires, Facilities, and Materials	$241,682.00	Council previously made a policy call to fund although against attorney advice.	Yes	No		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$241,682.00	$0.00	**$26,853.56**
33	**Restorative Justice**	Salaries	$650,075.72			Through Contract	Contract for professonal services	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$650,075.72	$0.00	**$72,230.64**
34	**Central Wyoming Senior Services**	Food	$220,000.00		Yes	Yes	WY Constitution 16-6	$220,000.00	$220,000.00	$150,000.00	$220,222.00	$0.00	$222,000.00	$220,000.00	$200,000.00	$220,000.00	$220,000.00	**$185,802.44**
35	**Arc of Natrona County**	Salaries and Activities	$60,000.00		Yes	Yes	WY Constitution 16-6	$50,000.00	$60,000.00	$20,000.00	$60,000.00	$39,000.00	$0.00	$50,000.00	$60,000.00	$60,000.00	$60,000.00	**$45,444.44**
36	**Central Wyoming Rescue Mission**	Facilities and Maintenance	$200,000.00	Late	Yes	Yes	WY Constitution 16-6	$0.00	$200,000.00	$50,000.00	$46,000.00	$100,000.00	$153,797.80	$100,000.00	$100,000.00	$200,000.00	$200,000.00	**$127,755.31**
37	**Natrona County Health Department**	Vehicles and Furniture	$100,000.00	Late	Yes	Yes	WY Constitution 16-6	$0.00	$100,000.00	$75,000.00	$75,000.00	$0.00	$25,000.00	$0.00	$100,000.00	$100,000.00	$0.00	**$52,777.78**
							TOTAL	$3,000,000.00	$3,171,280.00	$2,552,500.00	$3,083,421.00	$5,525,000.00	$2,565,527.18	$3,100,000.00	$2,326,000.00	$10,121,356.77	$4,813,350.00	**$4,140,159.44**
	Other agencies included in the 1%16 Fund Proposal																	
1	**Nicolaysen Art Museum**	Faclities	$413,131.00	Added to City Allocation.	Yes	Yes	Wyo. Stat. 15-1-111	$400,000.00			$400,000.00				$0.00			

One Cent #16 Community Projects Summary

	Organization	Description	Amount Requested	Notes	Previous Funding	Able to be Legally Funded	Statutory Reasoning	Staff Recommendation	Shawn Johnson	Charlie Powell	Chris Walsh	Bob Hopkins	Jesse Morgan	Ray Pacheco	Mike Huber	Dallas Laird	Kenyne Humphrey	AVERAGE
2	**CATC**	Salaries, Services, and Subsidies	$1,712,000.00	Added to City Allocation.	Yes	Yes	WY Constitution 16-6	$1,600,000.00			$1,600,000.00				elsewhere		$1,600,000.00	
3	**Casper Housing Authority**	Salaries, Facilities, and Supplies	$538,400.00	Added to City Allocation.	Yes	Yes	WY Constitution 16-6	$500,000.00			$0.00				$0.00		$500,000.00	
4	**Platte River Trails Trust**	Overhead Costs and Capital Infrastructure	$1,000,000.00	Added to City Allocation.	Yes	Yes	Wyo. Stat. 15-1-111	$1,000,000.00			$250,000.00				$0.00			